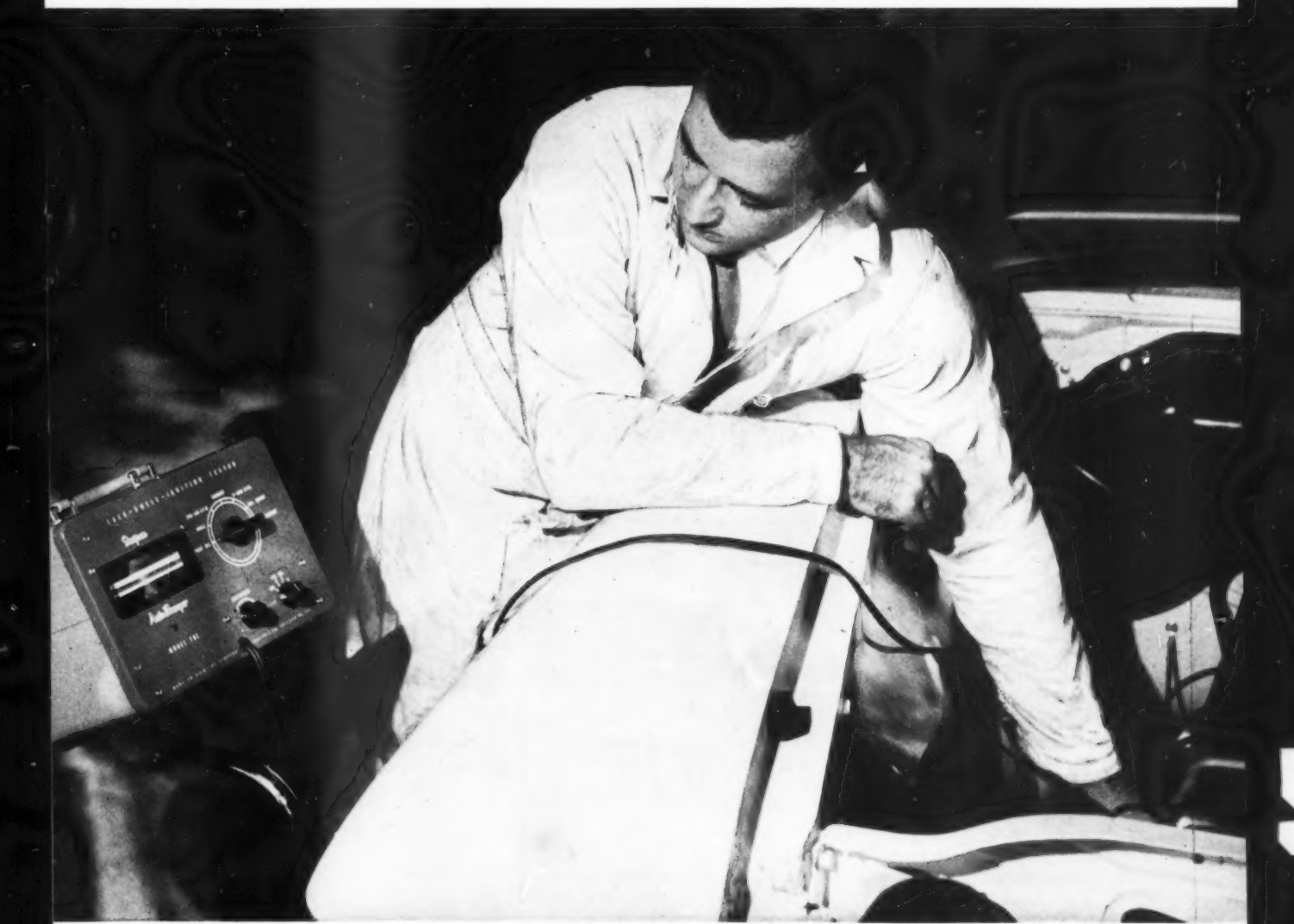
Automotive Service Digest

Our 49th year

February, 1961



Making the most of instruments—See page 28.

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*MOTOR—June, 1959

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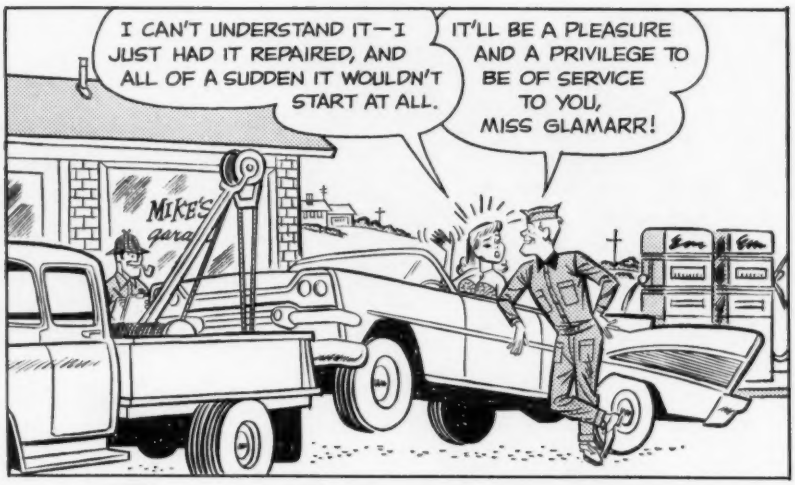
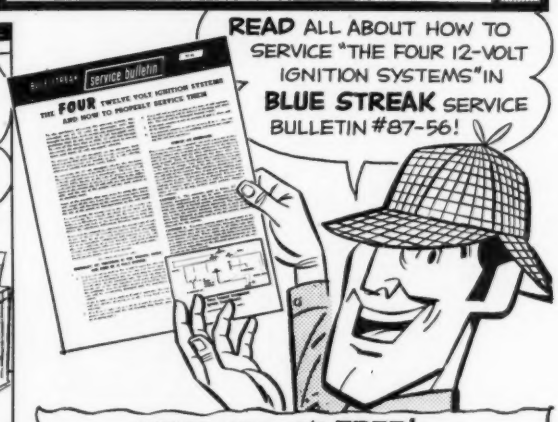

I CAN'T UNDERSTAND IT—I JUST HAD IT REPAIRED, AND ALL OF A SUDDEN IT WOULDN'T START AT ALL.
IT'LL BE A PLEASURE AND A PRIVILEGE TO BE OF SERVICE TO YOU, MISS GLAMARR!
MIKE'S

MADAM, THIS CAR HAS A 12-VOLT IGNITION SYSTEM! IT IS OBVIOUS THAT THE INCORRECT 12-VOLT COIL HAS BEEN INSTALLED! UNQUESTIONABLY, THAT IS WHY YOUR CAR WILL NOT START!
RIGHT, SHERLOCK! IT'S A WONDER TO ME THAT THE COIL HOUSING DIDN'T BLOW APART!

EXACTLY, MICHAEL! THERE'S TROUBLE IF YOU SUBSTITUTE ANY BUT THE SPECIFIC COIL CALLED FOR IN A 12-VOLT IGNITION SYSTEM! AND THERE ARE SEVERAL DIFFERENT 12-VOLT SYSTEMS TO CONSIDER!
AND I'D BETTER CHECK TO SEE IF THE EXTERNAL RESISTOR IS OPEN OR SHORTED!*
* ON LATE-MODEL GM CARS, THE RESISTANCE IS BUILT INTO THE WIRING HARNESS GOING TO THE COIL.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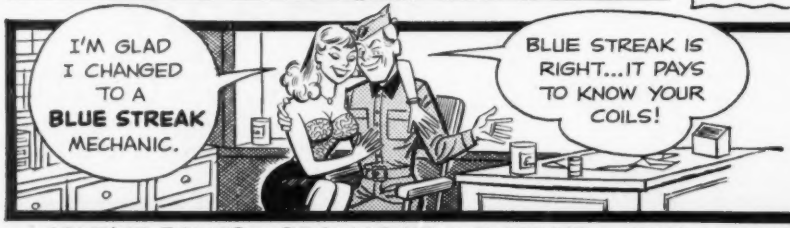

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VOLUME XLIX
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February 1961

Automotive Service Digest

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Cover Subject

The ignition and tune-up specialist is shown making a cam-dwell test, typical of many tests possible with good instrumentation. Before modern testing instruments came into use, the operator had to make a time consuming and frequently inaccurate measurement of point gap opening with feelers.
(Photo, courtesy Simpson Electric Co.)

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Technical help for the service shop

Tech Know-How **articles cover how-to and what's new in approved, up-to-date shop practices, as seen and understood by men experienced in the trade.** ***Business Know-How,*** **the dollar-sign side of automotive service work;** ***Service Education,*** **the who-what-where-how of today's trade training.**

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Automotive clinic

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Address your letter to Automotive Clinic c/o AUTOMOTIVE SERVICE DIGEST, 900 So. Wabash Ave., Chicago 5, Ill.

Ben Ikert, Editor

A Reader Comments

In the second paragraph under Light Load Test on page 46 of your November, 1960 issue (Testing Automotive Batteries), you state, "However, if any cell reads less than 1.95 volts, the battery should be recharged to a state of full charge." This should have read, ". . . if *all* cells . . ." If two cells are over 1.95 and one cell below 1.95 and all are still within .05 volt, the battery is OK.

—N.B.S., Denver, Colo.

Answer: Many thanks for taking the trouble to write us, commenting on our statement. We agree that your statement is correct, and the fact that if all cells are under 1.95 the battery should be recharged is mentioned in the next paragraph of the article. It does our heart good to find that a person reads our articles as carefully as you do.

Piston Failure

We recently tuned up a 1959 Mercedes 300-D, with fuel injection, into which we installed a set of 4GS150 Autolite spark plugs. After about 700 miles of excellent performance the engine broke down on the New York Thruway while going 60 mph. There was no preliminary indication of trouble. However, there was what sounded like three explosions and a lot of smoke and then the engine simultaneously lost power.

Inspection showed that there was a hole in the top of one piston approximately one inch in diameter. The other five pistons were not damaged and appeared quite normal. The automobile dealer claims the 4GS150 Autolite plugs we installed were too hot, causing the trouble. We feel there was some other cause, possibly faulty fuel injection.

Can you tell me what really could have caused this piston failure?

—F.J.H., New York, N.Y.

Answer: We have seen pistons burned as you described in your letter, and in each case it has been due to detonation. If you examine the piston carefully you will see some burned spots around the edge of the piston or the top ring groove.

In this case we assume that the mixture in the cylinder with the damaged piston may have become leaned out and if the ignition timing on the engine happened to be somewhat advanced, detonation could have occurred in the one cylinder, which resulted in the burned piston.

The fact that only one piston was burned would tend to rule out spark plugs being too hot. Furthermore, if they were too hot, the engine would have started to run roughly from preignition and the condition of the plugs would show excessive heat.

With timed fuel injection it would be possible to have one cylinder, under some conditions, to get a leaner fuel-air mixture than the others, and it is our guess that this is what happened in this case.

Distributor Removal

Servicemen are having considerable trouble getting out the distributors on V-8 Fords, from 1954 on. This distributor is mounted at the rear of the engine, and is hard to get at. However, it has to be removed for proper servicing on the synchrograph to check dwell, lost motion, advance, defective vacuum chambers, etc.

On many of these Ford engines the distributor becomes corroded fast, and cannot be lifted out. I have found an easy way to get them out.

Remove the rear throttle linkage bracket (to get working room). Then take the wedge-shaped tool used to drive out pitman arm and tie rod ends and drive this between the distributor clamping collar and the engine block. As soon as it "gives" a little, apply penetrating oil, blow it in under air pressure and allow it to set overnight, if you can. Take the wedge and start driving while applying generous squirts of penetrating oil. The most stubborn ones will come out this way.—*R.F.Z., Canton, Ohio.*

Chevy's Top Speed

Recently a customer came into my shop and complained that his 1960 Chevrolet with a standard transmission, 348 cu. in. engine with special cam and triple two-barrel carburetors was not running properly.

After checking the car with my 'scope I found the coil was wired wrong, and there was reverse polarity at the plugs. In checking further, all I found wrong was the reverse polarity and valves out of adjustment. In tuning up the car compression was checked, valves were adjusted, plugs and points were replaced, fuel pump pressure was checked, and the carburetors were cleaned and checked out on the combustion analyzer. The distributor was completely checked out on the machine.

The car was then checked with the 'scope and available voltage was over

(Continued on page 10)

Take advantage of your Automotive Service Digest clinic. Countless other shopmen do—so why not you? Your participation is welcomed.

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GM CHEVROLET GENUINE PARTS

there's no business like Chevrolet business . . . make your Chevy dealer your partner in service!

Clinic . . . *(Continued from page 7)*

30,000 volts at the plugs and the engine checked out good. My customer tells me the car never ran better, except that it will not rev up over 5,200 rpm at wide open throttle on the road. . . . In other words, the engine will just quit at 5,200 rpm on the road.

My question is this: What is the top rated rpm for the '60 Chevrolet 348 engine with special cam? My customer says the engine runs fine except it should have a top speed of 6,000 rpm. In fact my customer stated the car would rev up to 6,000 rpm shortly after he purchased the car.

This doesn't sound right to me, but I'll await your decision on this.

—P.E.A., DeSoto, Mo.

Answer: The Chevrolet 348 engine develops its maximum power at 4,400 rpm; the Corvette engine develops its maximum power at 5,000 rpm.

If your customer's car gets up to 5,000 rpm on the road he is getting about all this engine will put out. If he claims he got 6,000 rpm, there is something wrong, because at 6,000 rpm with an axle ratio of 3:1, this engine speed would mean a road speed of almost 172 mph, which we both know is quite improbable. At 5,000 rpm the road speed would be 145 mph, which is pretty high for a stock car. Therefore, we cannot help concluding that your customer is mistaken in his figures.

We checked with several Chevrolet shops, and they state that 5,000 rpm is about the top speed for this engine, with mechanical lifters and high lift camshaft.

Front End Shimmy

I, too, have encountered the front end shimmy problem on '58 Chevy ½-ton pickups, as published in the December, 1960 Clinic. In every case I checked and replaced all worn parts, set front end alignment and balanced all wheels, with no results. In every case, however, the tires were worn round. After replacing the tires with new ones with a good flat tread, the shimmy was gone. It seems that when the tire treads become rounded, and the driver hits a bump, the two tires get to fighting each other.

—F.L.C., Dumont, Iowa.

Answer: What you say sounds pretty sensible, and it is entirely possible that the tire tread could make the difference between shimmying and not shimmying.

With wheels that are properly balanced, and a steering system that has all joints reasonably tight, there should be no shimmy. If shimmy does occur, it could be due to tire treads that are not the same on the two front wheels, or, as you suggest, rounded treads which would not have the stability of good flat treads.

Having the air pressure the same in the two front tires also helps to avoid shimmy.

Adjusting Hydraulic Lifts

Am having trouble adjusting the hydraulic valve lifters on a 332 cu. in. 1958 Ford engine. The rocker arms have an adjusting screw. However, my books show no adjusting screw. Is it possible that the rocker arms are the wrong ones. If the arms are correct, how many turns should I turn the adjustment from a zero setting?

—F.G., Jamaica, N.Y.

Answer: Some of the early production 332 cu. in., 1958 Ford engines did have adjustable rocker arms, so the arms are correct.

To adjust them, have the hydraulic lifters fully depressed and then allow .070" clearance, measured with a thickness gauge, with the lifters def-

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IS YOUR ADDRESS LABEL PINK?

If it is, it will pay you to turn to page 64 of this issue for an important message.

initely on the heel of the cam for each valve. This can be checked by watching the valves as the crankshaft is rotated. The exhaust valve will open and close, followed by the opening and closing of the intake. A quarter turn more of the crankshaft will put both valves on the heel of the cam, and they can then be adjusted.

With hydraulic lifters the adjustment cannot be made with the engine running, as with mechanical lifters, as the lifters would be pumped up and clearance would be zero.

More Get-Up-And-Go

The owner of a 1960 Pontiac equipped with the big V-8 engine, wants me to install larger exhaust valves in it to give him greater performance. I am wondering if two inch exhaust valves or high performance 2.07 in. Chevrolet valves could be put in without going through the water jacket.

—E.B.H., Kenosha, Wis.

Answer: Putting in larger exhaust valves will not help much. If you did anything with the valves, the intakes should be changed so as to assist engine breathing. However, it would be easier and safer to put in a high lift camshaft to give better breathing rather than trying to enlarge the valve size.

By raising the valves more when they open you accomplish the same thing that larger valves will accomplish to as great an extent as it would be advisable to go and still have an engine that would be suitable for normal city driving.

If you want a car that is used strictly for drag racing, there are several things that you could do, such as increasing compression ratio by stroking the crankshaft or putting in special high compression pistons; putting on a four barrel carburetor or three two barrel carburetors; polishing the valve passages; increasing rear axle ratio; putting on dual exhaust system, etc.

Rod Burning

Was interested in W.L.T.'s letter about the '57 Dodge burning the No. 3 rod. I have had several of these Dodge engines (and Plymouth, too) burn the No. 3, as well as other rods. In each case I found the main bearing upper shell drilled off enough that when the engine became worn it starved the rod bearings. I always align the upper shell (insert) to align with the hole in the block by filing the hole in the insert. You're right—there is something wrong with the engine. Could it be poor inspection?

—V.L., Independence, Mo.

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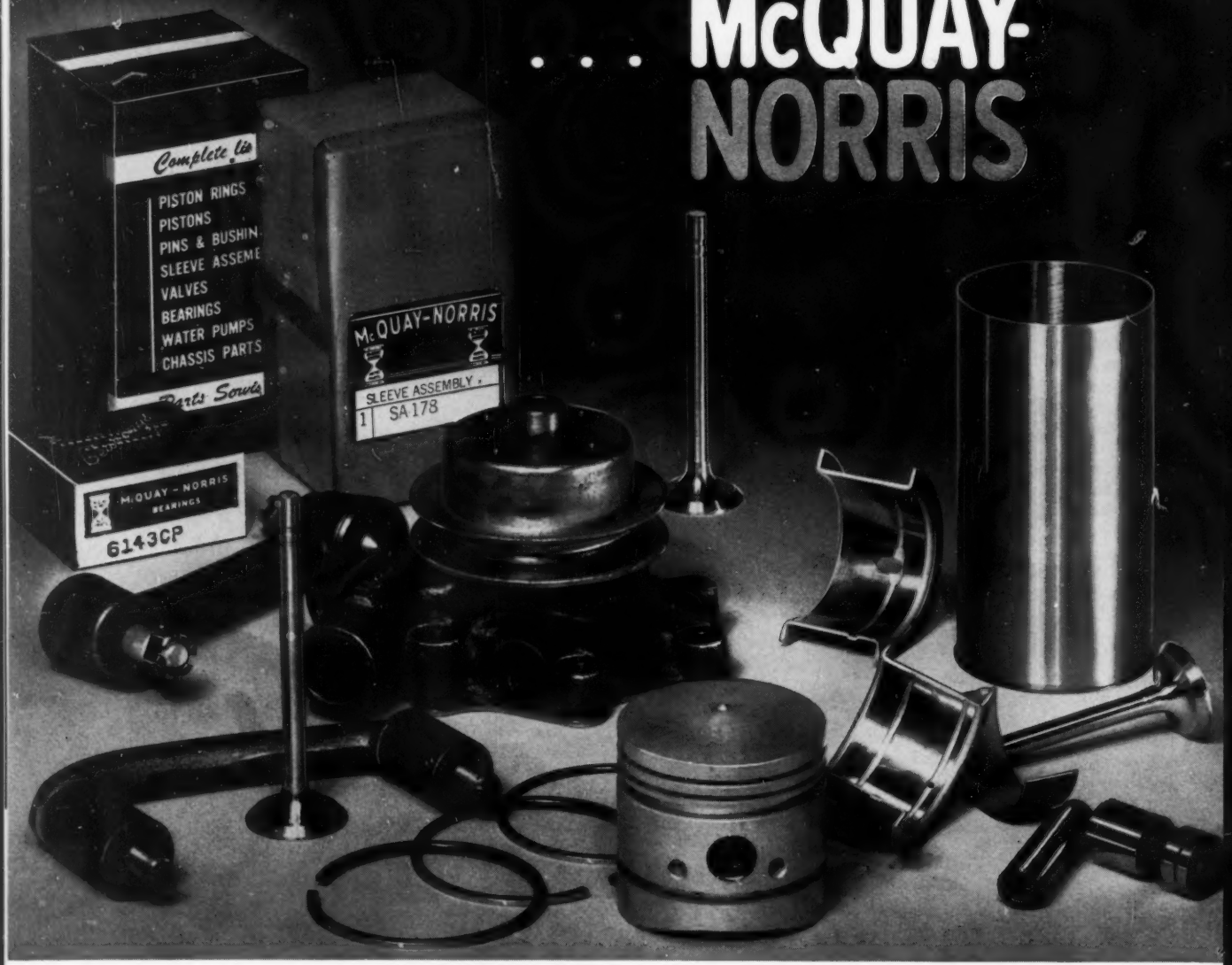

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Editor's page

Making new ones from the old

• PROBABLY FEW, if any, shop operators, mechanics or service personnel, when confronted with a brand new '61 rolling through the door, associate the car with one they might very well have worked on previously—parts of it, in some form or other.

Not to prolong the suspense, the point we're trying to make is that old cars never actually die. After being literally cremated in junk yards their remains—frames, bodies and a lot of other parts—find their way to the mills to help make steel for their descendents —the new cars.

In fact, Stanton P. Nickerson, writing for the Ethyl News, says that so basic is this vast appetite for apparently useless cast-offs, that as a whole, the steel industry in normal times combines close to a ton of scrap with a ton of pig iron in everyday production.

The article states that metals which have been refined before, contain few impurities and so reprocessing them helps cut costs and promotes the quality of new cast ingots.

Outstanding consumers of new steel are, of course, the motor vehicle assembly lines in Detroit and other cities. Consequently, when the buyer of a new car drives into your shop, chances are it contains at least some elements of an earlier model car. Maybe, a car your shop has worked on before.

In many cases old car bodies complete with frame are pressed into blocks weighing from one to two thousand pounds, then shipped to steel mills for addition to pig iron in process furnaces.

That, states the author, is what is happening currently to most cars which were the latest and best along about 1950 or earlier.

In 10 years or thereabouts, reincarnation will be under way for today's dreamboats as inevitable obsolence and wear relegate them to the scrap heap. Brings to mind the old saying "Don't worry. It won't last. Nothing does."

Ben Ikert
EDITOR

AUTOMOTIVE TECH KNOW-HOW

Transaxle levels the floor—and the ride

Of the many new innovations making their appearance on the 1961 model cars, one of the most outstanding and spectacular is the first American version of the transaxle for eliminating the front transmission tunnel that makes 6-passenger large-car comfort possible in a family-size "compact" car.

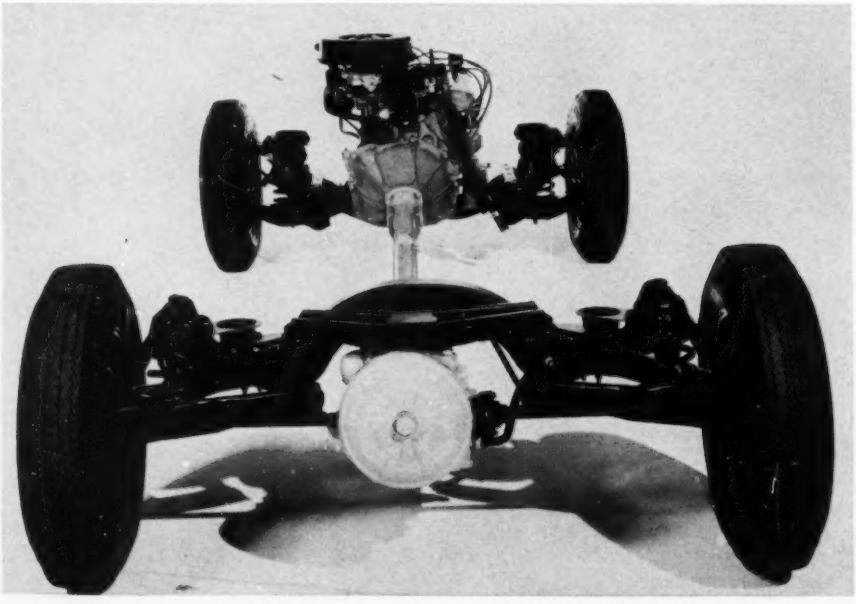
• THE YEAR 1960 MARKED the culmination of engineering projects which in some cases have been "in the works" for many years. Among these may be mentioned the cast aluminum engine block, the use of the silicon dioxide alternator and particularly the first American version of the transaxle as it appeared on the Pontiac Tempest.

As automobiles became lower and lower, the hump, or tunnel, in the front compartment became larger and larger and more obnoxious. While improvements in transmission design have resulted in materially reducing the size of this hump, the transaxle makes possible its practical elimination. As Pontiac puts it, "the elimination of the front transmission tunnel is the single factor that makes 6-passenger large-car comfort possible in a family-size car."

Advantages claimed for the rear transmission, in addition to eliminating the front compartment hump, are improved weight distribution and an increase in "radius of gyration" resulting from moving the transmission to the rear, thus lowering the pitch frequency of the car. The Pontiac suspension was designed to give the smaller car a "big car ride" over a wide variety of load and road conditions. Another advantage is that the rear transmission fits into the otherwise wasted space between the rear seat back and the rear axle. This is accomplished without any increase in the dimension of the distance from the dash to the rear axle center line and without any material sacrifice of luggage space in the trunk.

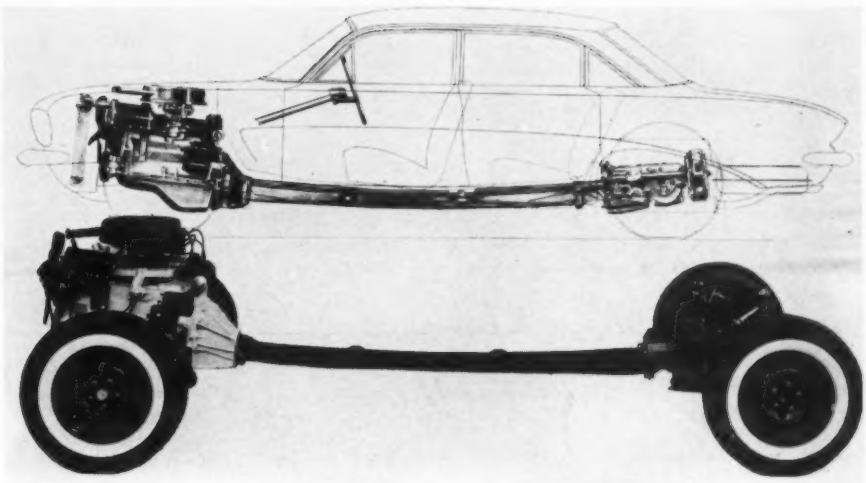
SWINGING AXLE DEEMED BEST

However, with the transmission and rear axle located as a unit at the rear, it was natural that



Rear view of the Tempest chassis, showing independent front and rear suspensions and mounting of the transaxle unit.

By J. EDWARD SCHIPPER
Detroit Editor



Side view of Tempest chassis shows power transmission line and contour of torsion bar type propeller shaft.

new problems of rear suspension had to be solved. Pontiac selected the swing axle as the best solution since the elimination of the tunnel practically dictated the need for an independent rear suspension.

As with the front suspension, the rear suspension unit is a complete assembly mounted to a box-section cross-member. This cross member not only supports the suspension and drive components but the side-to-side suspension forces are balanced out within this member which is bolted to the car through four large rubber cushions. With this rubber insulated member road noises, vibration and harshness are measurably reduced. The suspension arms are an assembly of two stampings welded together to form a box member. These arms are torsionally rigid to carry the loads sustained in severe braking.

The transaxle assembly is solidly bolted to a light cross member which is, in turn, rubber-mounted to the main rear suspension cross member. These mounts are at the center of gravity of the transaxle unit in order to reduce gravity bending stresses on the torque tube.

Shims are placed between the transaxle and transaxle cross-member to adjust the rear suspension toe in. This moves the entire drive train assembly fore and aft and an additional 1/4" of clearance is provided in the engine compartment for this.

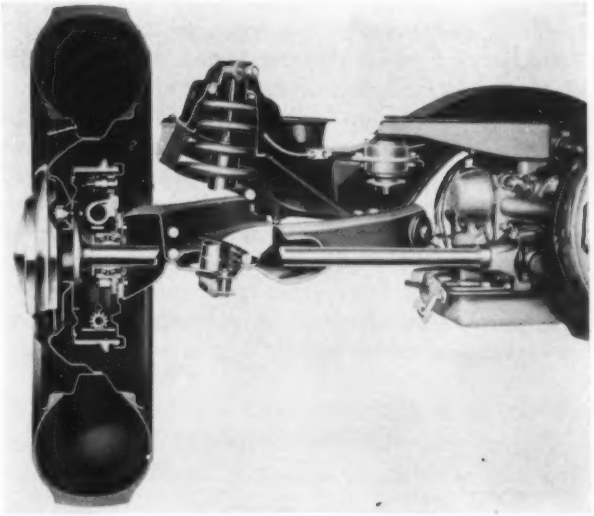
"ROPE" DRIVE SHAFT PROVES ITSELF

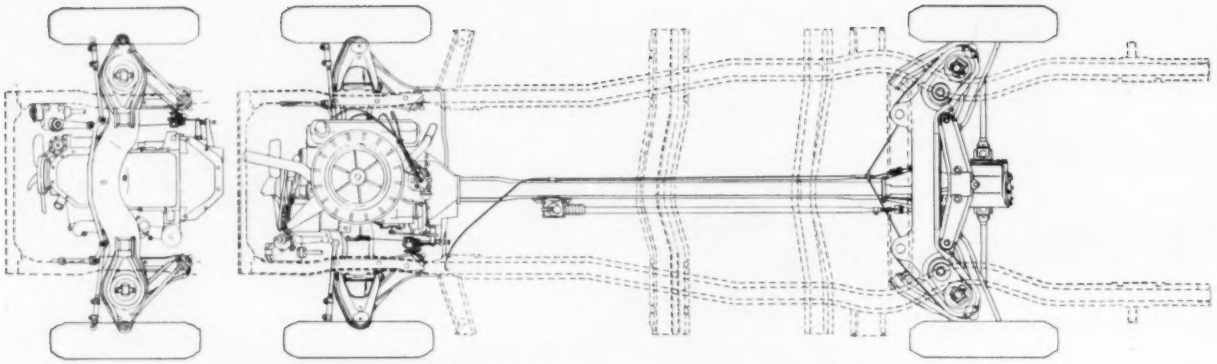
Drive progresses from the engine to the transaxle through a propeller shaft enclosed in a torque tube. The propeller shaft is a long, thin, torsion bar which has come to be known as Tempest's flexible or "rope" drive shaft. When first introduced, this method of drive caused many an engineer to raise his eyebrows and wonder if it would do the trick. After many miles of test and owner experience, it has been proven to be completely successful. The torsion bar is bent in a gentle circular arc transmitting the drive from the engine to the transmission. It was found that the engine torque, which is all of the load that the shaft will carry, can be transmitted by a bar 5/8" or less in diameter without over-stressing the material.

As explained by John Z. DeLorean, Pontiac engineer who delivered an interesting paper for the SAE on this subject, "A shaft of this length and small diameter will, of course, have critical speeds within the operating range of the engine. Since the propeller shaft has not moved relative to the car, it is possible to provide intermediate bearings to eliminate these critical periods. These sealed ball-bearings are mounted to the propeller shaft with split rubber half-shells and rubber mounted to the torque tube for isolation.

"The ends of the bar are rigidly held to impress the proper end moments to give a uniform bending stress over the length of the bar. This moment is carried by the crankshaft main bearings and the transmission extension bearings.

Cross-section of Pontiac's transaxle. Differential and final drive is mounted to the sprung mass of the car.





Diagrammatic plan view of the 1961 Pontiac Tempest chassis.

"The propeller shaft gives us a tunnel of 3" to 5" lower in the critical areas than conventional configurations. It is completely service-free since the bearing loads are negligible. The sealed-in lubricant easily lasts the life of the car. The soft torsional rate of the bar causes it to form a low pass filter that effectively isolates engine harshness from the transmission. In combination with soft engine mounts, the engine is virtually isolated from the car. This is one factor that accounts for the relative smoothness of the four cylinder engine. Of course, the bar eliminates the non-uniform velocity and second order bending moments characteristic of universal joints. The bar is subjected to a completely reversed bending stress each rotation.

"This stress is directly proportional to the diameter and the installed curvature, so each is kept as small as practical. On the other hand, the torsional stress varies inversely as the cube of the diameter, so the bar should be as large as practical. The bending stress is independent of the torque in the bar whereas the torsional stress, of course, is directly proportional to torque. Since the bar will operate most of its life at road load torques, the diameter is compromised in favor of the bending stress. Our tests show that a 5/8" bar will run over 50 million cycles at three times the bending stress in the Tempest and twice the maximum engine torque; far in excess of any automotive requirement."

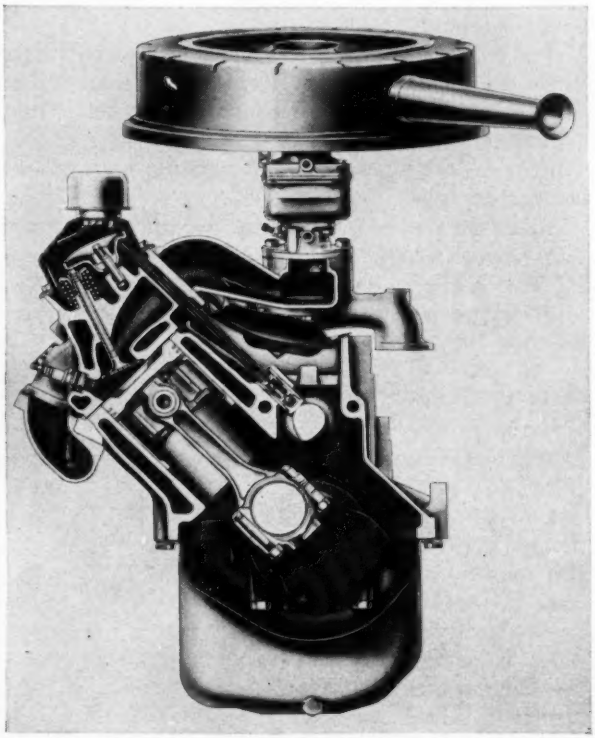
As can well be imagined, the flexible nature of the drive shaft in transmitting the rotational effort of the crankshaft back to the transaxle involved a high order of mathematical calculation. For this purpose, Pontiac engineers made extensive use of the computer by feeding into the instrument data from numerous tests. The computer calculations were particularly used to derive wheel jounce layouts, gear summaries and linkage layouts.

COMPLEX CALCULATIONS INVOLVED

As the propeller shaft passes through various phases in its rotation, it must be capable of oscillating within the confines of the torque tube. As it oscillates, the shaft assumes two typical situations or modes, the first mode being in the form of a simple whip and the second has a double whipping action so that the mode develops three modes, one at each end and one at the center. It has been found that two mounts, one-fourth to one-third of the way in from each end of the shaft adequately control these modes and hold the oscillating shaft within the desired bounds. Oscillations are developed by the rotating inertia of the engine, the flexible drive line and the rotating inertia at the transmission end.

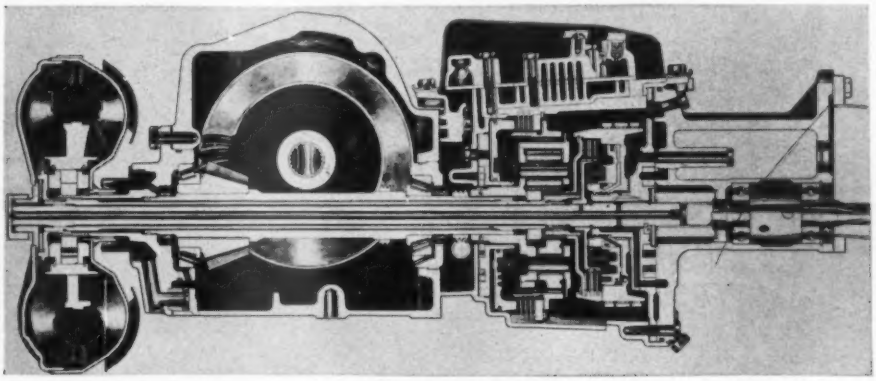
This very much condensed analysis of the system will only serve to indicate the complexities of the calculations involved. One of the factors which

Transverse section through the Pontiac Tempest standard four-cylinder engine.



makes the analysis difficult is the fact that while the firing impulses of the engine are the primary cause of exciting oscillation, these impulses occur at equal intervals of crankshaft rotation, but not necessarily at equal intervals of time. Pontiac engineers are engaged in further work on the analysis of the system but this is simply a matter which can probably be explained as "engineering curiosity" as the design as now incorporated in the product has proven to be highly satisfactory.

It is, of course, well understood that the engine, torque tube and transaxle arrangement in the Tempest is an entirely new concept. Leaving the theoretical calculations involved and turning again to the practical considerations of the unit, the torque tube, in addition to its function of enclosing the flexible shaft, has the additional function of protecting the driveline from the elements and stone damage. The driveline is coated with a rubber compound to prevent corrosion.



Section through automatic transmission. The drive is "split" in high range and the over-hung converter runs in the open. The drive from the engine must pass entirely through the gear box and the axle to the air-cooled torque converter at the rear.

SIMILAR TO THE POWERGLIDE

The Tempest automatic transmission is unique in two particulars: 1—The drive is "split" in high range and the overhung converter runs in the open. 2—The drive from the engine must pass entirely through the gear box and the axle to the air-cooled torque converter at the rear. As the general arrangement indicates, the automatic transmission, in principle, is similar to the Powerglide.

The input shaft, coupled to the torsion bar driveline, drives the front pump, then passes through the gearbox and axle to drive the converter. Converter output is taken through the pinion shaft to the gearset, the stator reaction is grounded to the axle pinion bearing retainer. The Ravigneaux type planetary gearset has a rear sun gear input, a short and long planet pinion carrier output, and a front sun gear forward reaction. The front sun gear reaction is taken by a two-wrap, high self-actuation, band.

A multiple-plate direct clutch couples the forward reaction sun gear to the input shaft. Reverse reaction is taken through a plate clutch to the internal gear. The carrier, splined to the axle pinion shaft, drives the output pump. The sump and valve body are conveniently located across the bottom of the gear case. The air cooled transmission is automatic shifting.

The three element torque converter is welded sheet steel as is the attached cooling fan and shroud. Its location is controlled by the pump shaft—there is a snap ring between the input coupling and the front pump drive plate which impresses the converter thrust on the washer inside the front pump I.D.—a snap ring and pipe cap fix the converter to the input shaft at the rear.

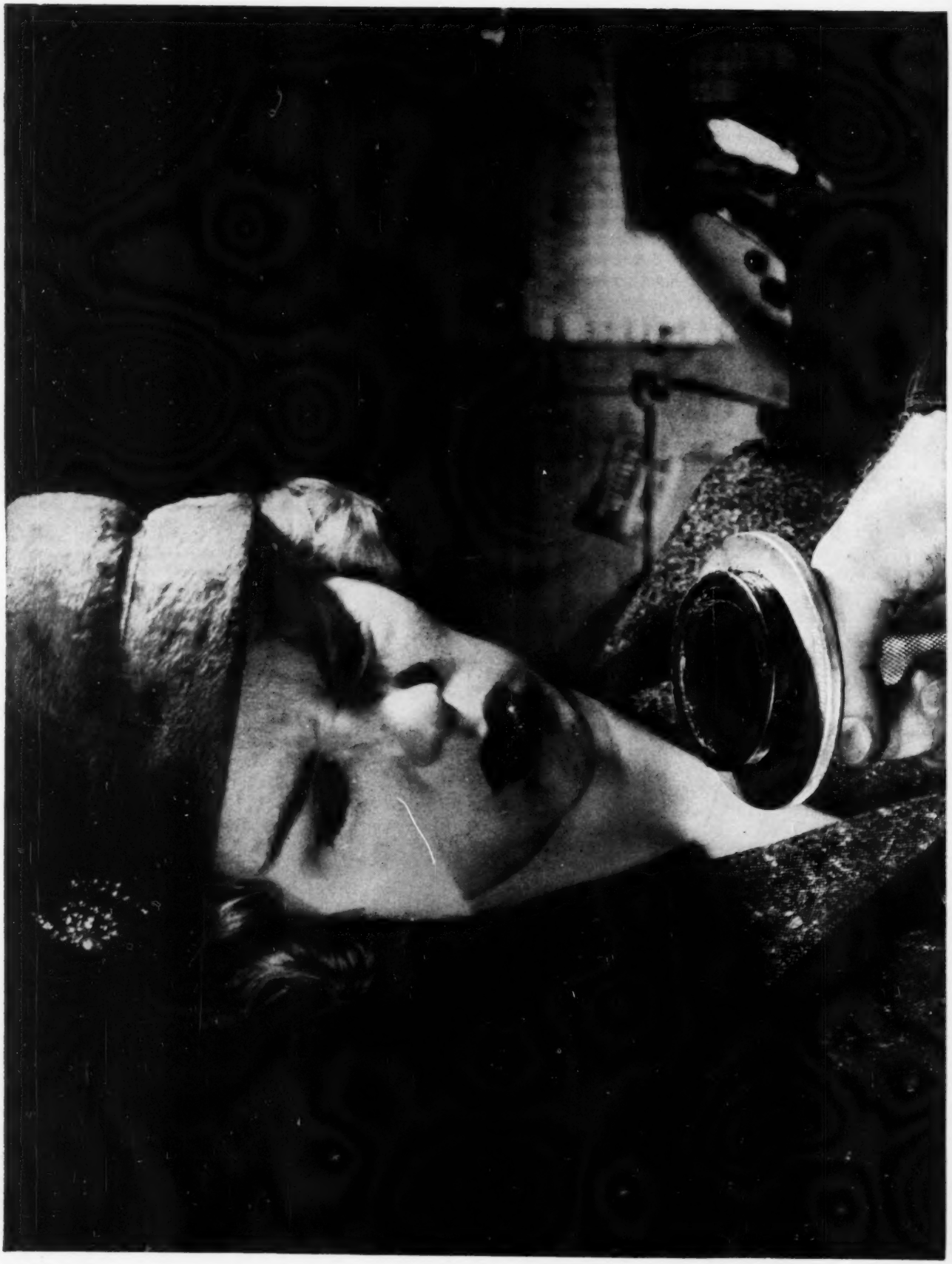
The low gear ratio is 1.82, the low to high shift is of the band to clutch variety. The forward band apply is "washed out" by clutch apply pressure on the retraction side of the servo piston—so that the servo is used as an accumulator to modulate the clutch apply pressure and cushion the engagement. The clutch apply pressure is also modulated by engine vacuum to smooth the shifts. Note that the two-plate clutch uses two divider plates at the center. This provides a "heat sink" to insure that all clutch plates work equally.

VIRTUES OF SPLIT TORQUE

The disposition of the components facilitates a split torque arrangement. In terms of output torque, the split is fixed by the gear ratio, 45 per cent mechanical and 55 per cent hydraulic. Split torque has a number of important virtues:

1. Reverse is accomplished by holding the ring gear of the Ravigneaux gear set. The reaction is taken to the die cast lugs of the transmission case by a multiple plate clutch.
2. Neutral is achieved by disengaging all of the elements.
3. The range selector lever is located on the instrument panel, and is connected to the selector valve by a cable and conduit assembly. The valve positioning detents are in the panel control rather than in the transmission.
4. The throttle valve control is conventional,

(*Continued on page 20*)



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except that the reach to the transmission is longer than usual.

5. The automatic controls result in an upshift schedule, with a 3.55 axle, between 16 and 50 mph depending on throttle position.
6. The downshift schedule is 10 mph at closed throttle, 35 mph wide open at the detent, and 44 mph wide open through the detent.

Available also is a 3-speed sychromesh transmission and clutch similar in construction to those in Pontiac's regular line. The single plate clutch is engine mounted and linkage actuated. The gear box is mounted ahead of the axle and high range is a direct concentric drive for minimum noise. The gear box weighs 22 pounds less than the Pontiac transmission despite identical center distance, pitch helix angle and face width. The transmission case is cast iron. The basic power flow is similar to that of the Pontiac three speed, but utilizes concentric input and output shafts. The output shaft is splined to the rear axle pinion.

FLOOR-MOUNTED SHIFT

The shift lever is floor mounted for simplicity and that "sports car flavor." The single rod shift control was adopted to eliminate the necessity of aligning the crossover at the shift lever with the interlock in the transmission. This control is very simple in operation, requiring only a straight fore and aft motion for shifting gears, and a rotational motion for selecting the desired shifter fork (either first-reverse or second-third).

Shifter fork selection is made by rotating the shifter shaft to which is attached a small shift finger. This finger then engages either of the shifter forks depending on the way it is rotated.

TRANSAXLE DIFFERENTIAL ASSEMBLY

The Tempest axle is a light-weight heavy-duty unit designed specifically for a high output family-sized car.

The above-center offset pinion is required to get sufficient road clearance under the transmission. Since it is desirable to have the pinion axial thrust load away from the ring gear, the drive pinion must be mounted behind the centerline of the ring gear and the pinion must have a right hand spiral. The machining of the pinion teeth does not allow the pinion and shaft to be made integral; the cutter interferes with the shaft. The pinion and shaft are assembled by means of a splined shrink fit. The pinion shaft has a 0.97 inch hole through it for the automatic transmission turbine shaft. The pinion shaft is carefully designed for rigidity and minimum pinion deflection. It is mounted on two 40° tapered roller bearings. The pinion rear bearing is carried by a flanged retainer.

Adjustment of the pinion is made by means of shims between the bearing retainer flange and the axle housing. The pinion front bearing is retained by an adjusting nut, which is also used to preload the pinion bearings. The speedometer drive gear is pressed on the pinion shaft and located inside of the axle housing. The automatic transmission governor is driven by another helical gear, sliding spline fitted on the pinion shaft and located between the axle and transmission.

Lubrication for the pinion and differential bearings is provided by means of catcher-ribs and oil holes; experimental verification shows the oil flow to be adequate under all operating conditions. The cavity within the housing provides for ratios between three and four to one.

The distance between the two axle shaft universal joints greatly affects the camber and tread change of the rear wheels. Minimizing this distance was one of the main problems in the differential design. The size of these parts must be first determined by proper stress analysis. A 2-pinion differential with 3.0" side gear diameter and a 0.686" diameter cross shaft was selected for the Tempest.

A further requirement to bridge the drive pinion shaft over the differential cage and the mentioned minimum distance between the universal joints made it necessary to mount the ring gear near the centerline of the differential cross shaft.

The entire differential cage assembly is carried by two tapered roller bearings of the same size. These bearings are retained by gray iron adjusting nuts—one of them screwed in the axle housing, the other in the axle housing side cover. Both sides of the axle housing are closed by seals operating on the shafts of the universal joint yokes.

The Tempest rear suspension and mounting configuration is relatively insensitive to rear axle gear noise. The universal joints are of a conventional type equipped with needle bearings and completely sub-assembled. The inner yoke has an external involute spline with a sliding fit to the side gears to facilitate assembling. The outer yoke has an internal involute spline pressed on the rear axle shaft and held in position with a screw in the axle shaft.

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Routing harmful crankcase vapors

In modern ventilating systems this is accomplished by returning water and fuel vapors to the engine induction system where they are consumed during fuel combustion. Normal maintenance of these systems assures effective operation.

• DURING COMBUSTION in the engine cylinders, oxygen of the air and hydrogen of the fuel form water, which passes out through the exhaust line as steam or a vapor. In a cold engine, some of the vapor condenses and works down into the engine oil pan. The resultant water mixes with the oil and is whipped into a thick, pasty sludge by the churning of the revolving crankshaft.

Also, gasoline vapor condenses on cold engine parts—some works down into the oil, thins it and destroys some of its lubricating ability. As the engine warms up to correct operating temperature the water and fuel evaporate and must be removed from the crankcase. This is done by the crankcase ventilating system. Rotation of the crankshaft sets up a whirling motion of the air and the forward motion of the car causes a vacuum on the draft tube through which the vapors escape into the atmosphere.

More recently, emission reduction systems have been devised which reduce the emission of undesirable crankcase vapor by-products into the atmosphere.

IN USE MANY YEARS

Crankcase ventilation as such has been in use many years. Every engine has some provision for ventilation, though such provision may, in some cases be inadequate, at least over a considerable portion of the speed range of the engine. Most engines are equipped with a road draft tube. This is a tube connected with the crankcase and dropping vertically from the rear of the engine. The end of the tube is bevelled, the purpose of which is to create a suction which will draw off the crankcase vapors. This system has the advantage of being simple and does not involve much plumbing. It has the disadvantage of providing adequate ventilation only between speeds of 20 and 60 mph. Under 20 mph there is not enough velocity past the draft

By BEN IKERT
Editor

Installed in this Studebaker Lark engine is the new smog-reducing device which is on all 1961 Studebaker cars for California delivery. Fumes are fed back into the engine's breathing system to be burned in the cylinders.

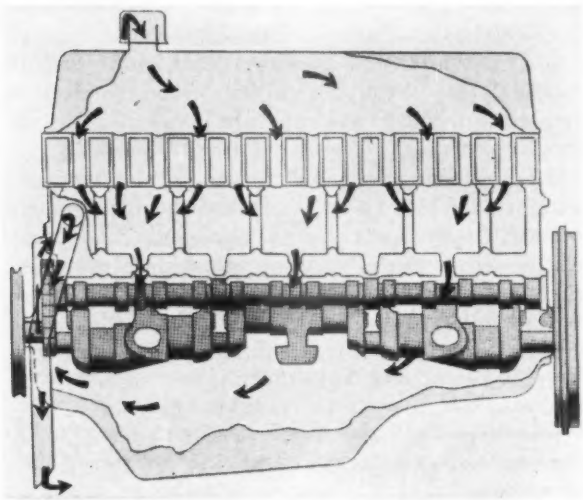
tube to cause the necessary atmospheric movement within the crankcase and over 60 mph there is so much suction that oil is liable to be pulled out of the crankcase.

As the draft tube moves through the air it creates a slight vacuum which causes vapors to be discharged. Fresh air enters through a metal-wool type air cleaner in the oil filler pipe, through the valve cover on OHV engines or other suitable points.

CONTRIBUTING FACTOR OF AIR POLLUTION

Crankcase ventilation is receiving more attention lately, especially since the Society of Automotive Engineers announced that engine blowby and resulting vapors and gases discharged from the engine crankcase were a prominent, contributing cause of atmospheric pollution. In fact pollution from this cause is said to be even more harmful than from the exhaust gases.

Because of the undesirable discharge of blowby gases, new cars destined for California are accordingly fitted with positive crankcase ventilating equipment. This equipment consists of a suitable tube, such as neoprene, running from the crankcase to a spot under the carburetor with passages into the openings which connect with the intake manifold.



Standard crankcase ventilating system of the '61 Comet engine. Ventilating air moves down past the push rods into the crankcase.

In the tube is a spring-loaded valve which controls the volume of the gases withdrawn from the crankcase to keep the volume inversely proportional to intake manifold vacuum. That is, when the engine speed is low and the load is light the vacuum will be high, but the need for ventilation is at a minimum. As engine speed increases and the load increases, vacuum drops, but the need for ventilation is greater.

Two types of valves—gravity-loaded and spring-loaded—are used, and both work well when they are new and clean. However, it is said that the gravity type, sooner or later becomes clogged with varnish and sludge-making elements from the crankcase vapors and gases. The spring-loaded valve does not seem to clog so easily but the spring, which controls the plunger, may eventually break from the corrosive atmosphere in which it has to live and thus, the valve becomes inoperative. If the valves are given attention, checked and cleaned periodically and broken springs replaced, they will do a satisfactory job. Few servicemen remind customers about these valves and since their lack of operation does not result in interfering with engine operation noticeably, the owner of the vehicle may easily forget about the valve.

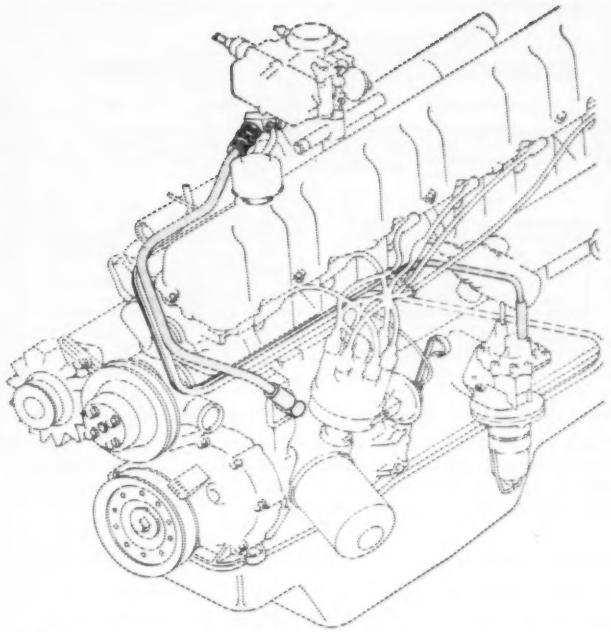
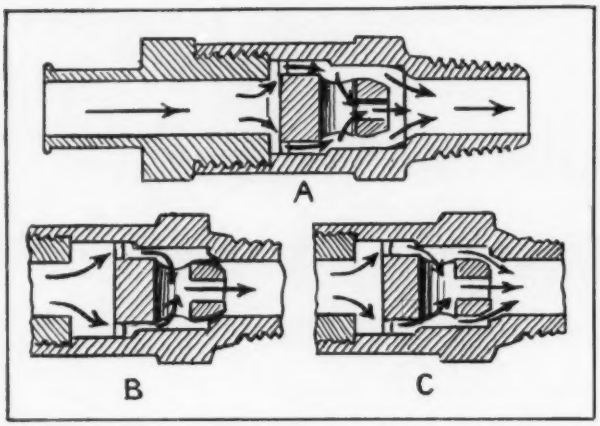


Diagram showing the 1961 Comet emission reduction system available as an option item for the 144 and 170 cu. in. displacement engines.

Lack of suitable crankcase ventilation extracts a heavy penalty, especially on engines that are driven at slow speed and for frequent short runs. This results in shortened engine service life, relatively poor normal ventilation, formation of harmful deposits, sticking rings, formation of sludge, rust, pitting of polished working parts, along with higher oil consumption.

Standard crankcase ventilation on the Comet engine, for example, incorporates air entering the engine through the oil filler cap located on the front of the valve rocker arm cover. The cap contains a maze filtering element.

Filtered air from the cap flows into the front section of the valve rocker arm shaft chamber. Here the air normalizes its temperature before contacting



Valve of the 1961 Comet emission reduction system. A, shows valve resting in partially opened position, due to a lack of spring tension applied to the valve. B, full tension; C, intermediate tension. (Tension spring not shown.)

contaminating vapors originating in the crankcase. Warm ventilating air minimizes the formation of crankcase sludge. The ventilating air moves down past the push rods into the crankcase. Air is diverted from the front section of the crankcase through holes in the front of the cylinder block wall to ventilate the timing chain chamber. The air from the crankcase is then directed into the crankcase ventilation tube by the rotating action of the crankshaft.

EMISSION REDUCTION SYSTEM

An emission reduction system is available as an optional item for the 144 and 170 cu. in. displacement engines. The function of this system is to reduce the emission of undesirable crankcase vapor by-products into the atmosphere. This is accomplished by returning these vapors to the engine induction system, where they are consumed during fuel combustion.

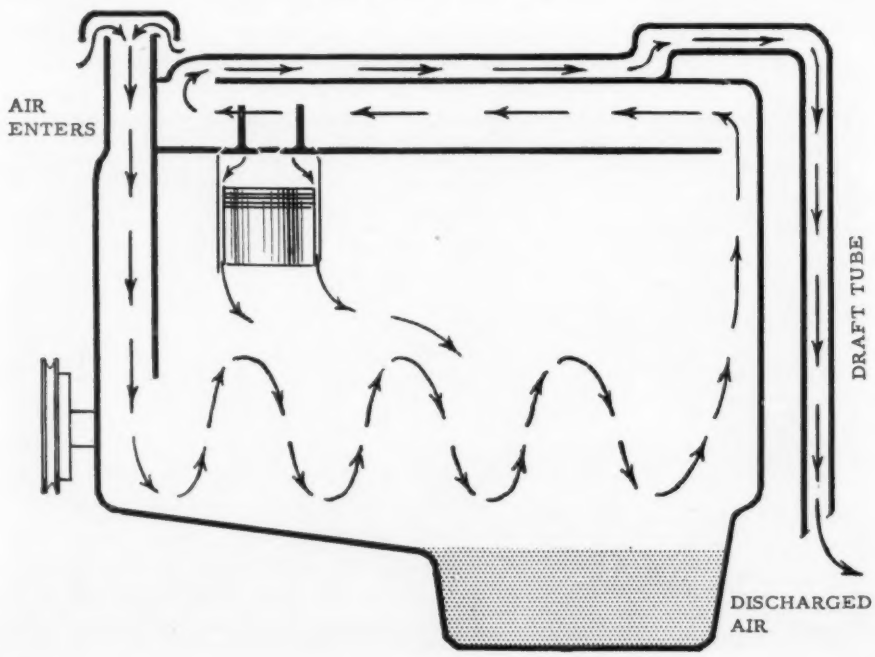
This system differs from the standard ventilation system in that the road draft tube is replaced by a tube and hose connection which leads from the crankcase ventilation outlet in the cylinder block to a crankcase ventilation regulator valve assembly. The regulator valve (consisting of a valve body, valve and spring) screws into a fitting located in a carburetor spacer of new design. A vacuum line and hose is connected between the fuel pump vacuum booster and a fitting in the carburetor spacer.

The vacuum regulator valve senses manifold vacuum and operates according to engine demand, thus providing the correct metered amount of crankcase ventilation and vacuum required by the engine under all operating conditions.

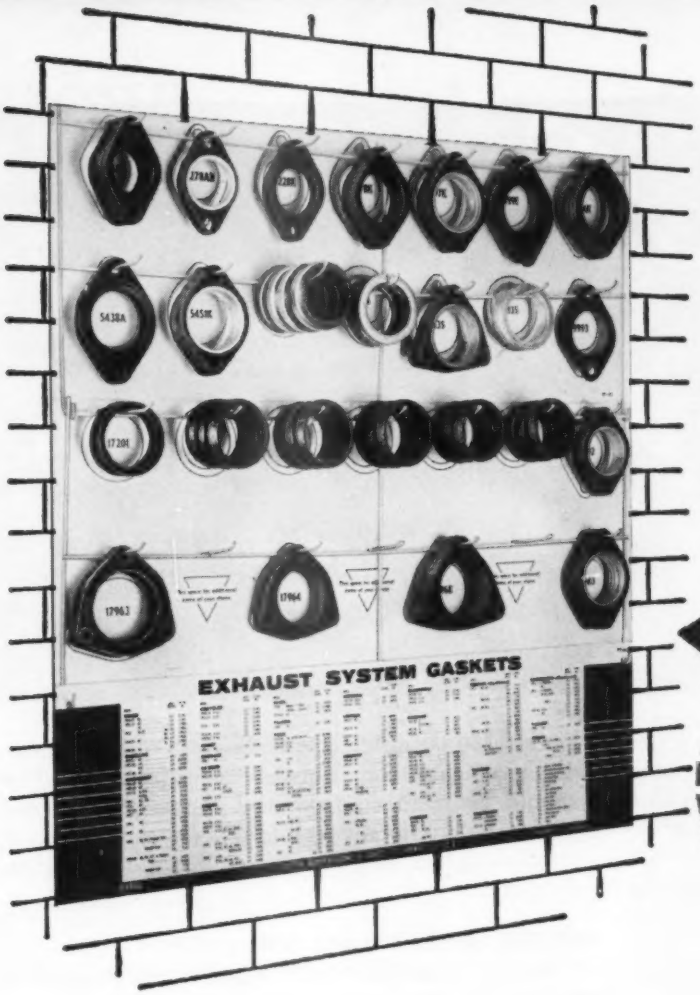
With the engine shut off, the valve rests in a partially opened position due to a lack of spring tension applied to the valves.

When the engine is operating at idle (high intake manifold vacuum condition), vacuum overcomes the valve spring force and seats the valve spool into its conical end. This action causes a small flow of the restricted crankcase ventilation air and vapors to flow through a drilled orifice, where it is metered into the air-fuel mixture below the throttle body.

When engine speed is increased, intake manifold vacuum decreases (road load) and the spring force gradually overcomes the vacuum pull. The interrelationship between vacuum pull and valve spring force positions the valve to provide increased induction of crankcase ventilation air and vapor by-products into the air-fuel mixture as it flows into the intake manifold.



Schematic showing the action of a crankcase ventilating system and how blow-by gases get past the piston rings under a partially warmed up engine. They are swept out of the draft tube providing vehicle speed and temperature is sufficiently high.



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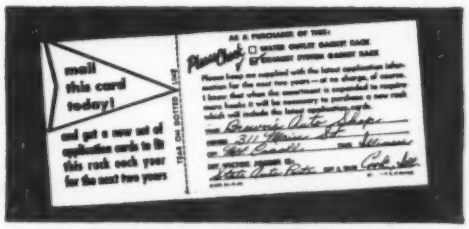

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Tester developed by AC Spark Plug Division of GM, which checks all positive crankcase ventilating systems using the AC-type valve. A, rubber adapter; B, tube; C, blank adapter.

At low intake manifold vacuum (high speed), the spring force positions the valve to obtain increased air and vapor flow for adequate engine ventilation and maximum combustion of crankcase vapor by-products. At high intake manifold vacuum (idle speed), the partially restricted ventilation air and vapors are recirculated in the engine crankcase and the metered flow (small quantity) of ventilation air and vapors is consumed during the engine fuel combustion.

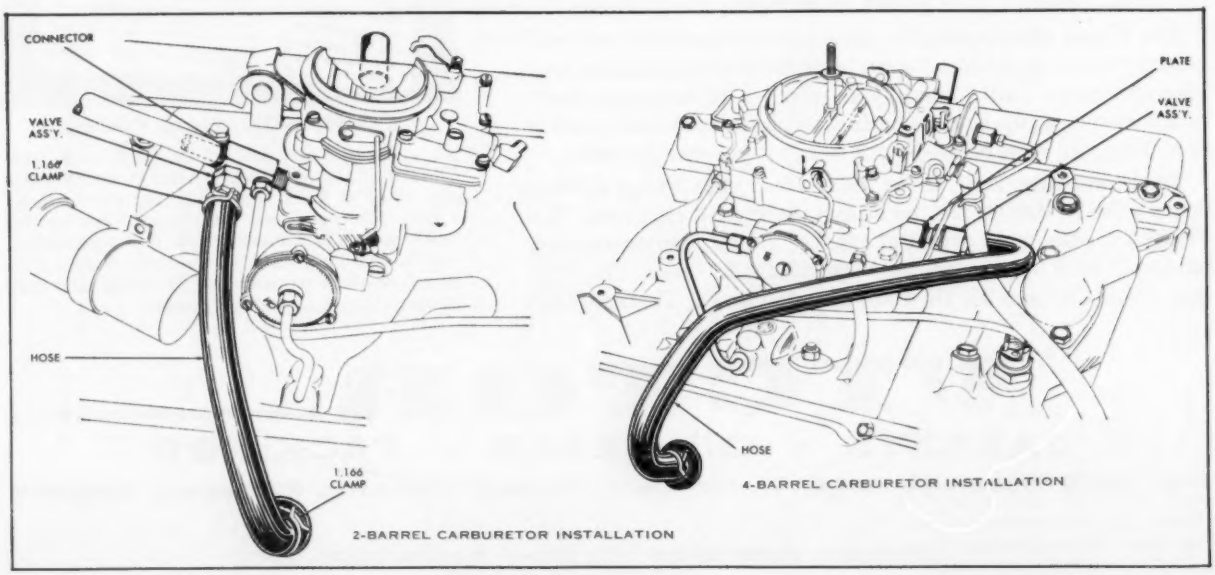
Due to the nature of crankcase by-products carried by the ventilation system, the valve and tubing are subject to fouling with sludge and/or varnish formations. However, normal maintenance will assure effective operation. At regular intervals of approximately 10,000 miles (depending on operating conditions) the valve, tubing, connections, and hose should be removed from the engine and cleaned. Under cold climatic conditions, or stop and go operation, the system may require more frequent cleaning.

POSITIVE VENTILATION SYSTEM

Positive crankcase ventilation is accomplished on the '61 Studebaker Lark by the use of engine vacuum. A controlled amount of fresh air is circulated through the crankcase and valve chamber at all engine speeds and loads. Air enters the oil filler cap and circulates through the crankcase, and into the

(Continued on page 56)

Positive crankcase ventilation as used on 1961 Oldsmobile two-barrel and four-barrel carburetor installations.



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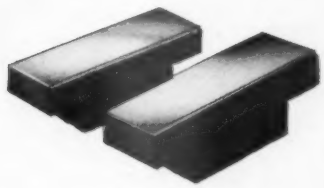

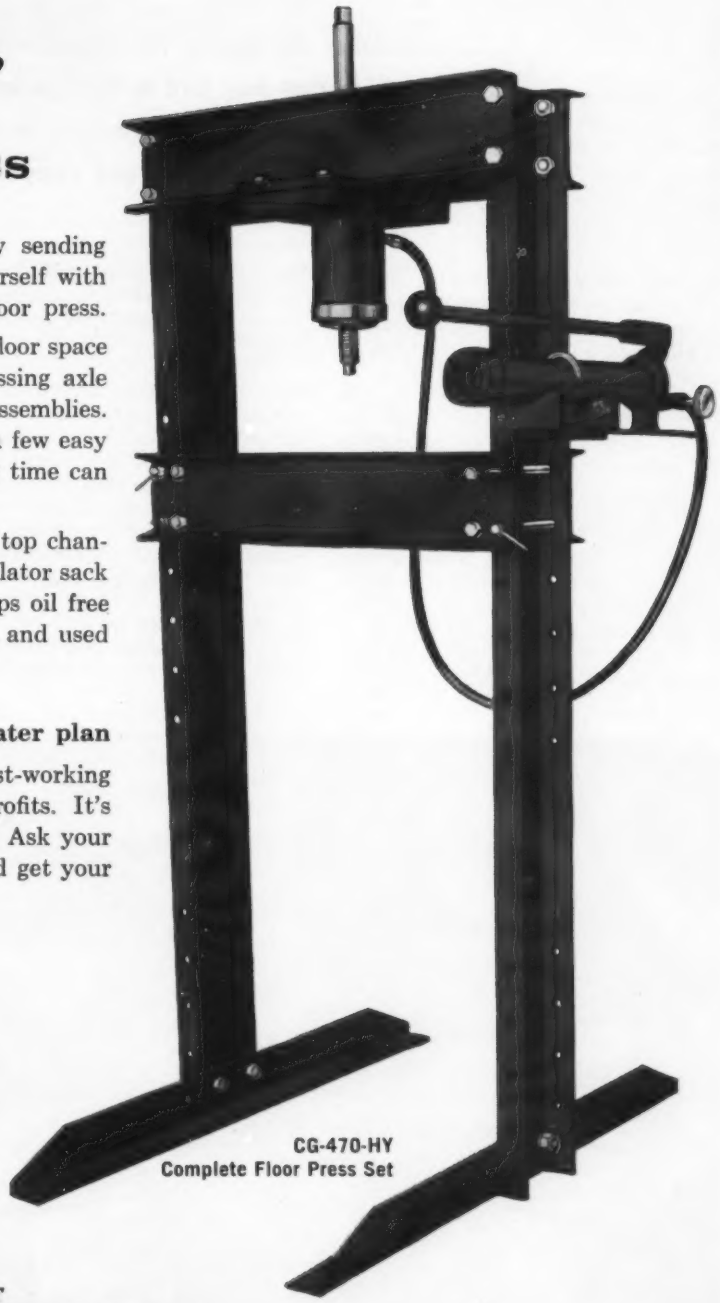

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AUTOMOTIVE TECH KNOW-HOW

Making the most of instruments

Whether its testing for overall engine efficiency or ferreting out insidious trouble that may lurk in the ignition system, precise equipment and constant use of it becomes increasingly more important as automotive powerplants become more exacting and complex.

By GUY F. WETZEL
Technical Editor

● THE TERM "instruments" in this article applies to the automotive test instruments that are actually a necessity to all shops doing competent tune-up, diagnosis and trouble shooting.

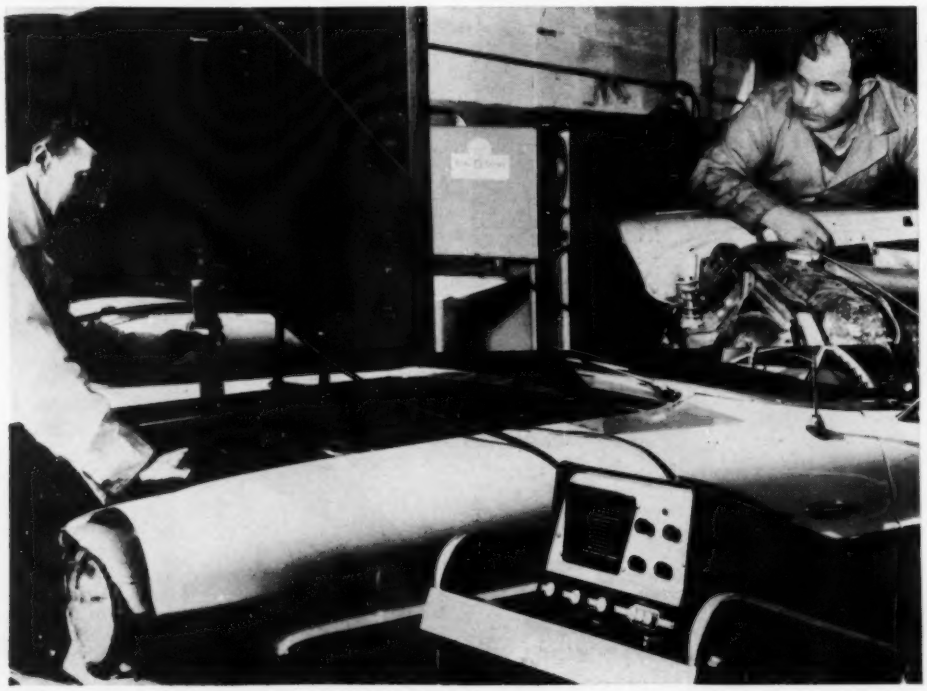
But, unfortunately when you look around, there are numerous service shops where (1) there are practically no instruments, or the instrument equipment is inadequate, or (2) there is some instrument equipment but it is not used. And, it seems there are still far too many men in the service business who call themselves mechanics but who are unable or unwilling to use automotive test instruments.

As a matter of fairness, these men are entitled to ask, "Why should we bother to use instruments? We are 'getting by' and instruments cost a lot of money, and it takes time to use them!"

If there were not a good answer to the question "Why should we use instruments?" there would be no reason for publishing this article. There is no argument about the statement that late model motor cars are powered by sensitive, high output, high compression-ratio engines. In order to give reasonably good performance every item that enters into engine performance must be correctly adjusted and in good working order.

Electrical values and gaseous pressures affect engine operation, but these cannot be evaluated by any of our human faculties. Therefore, instruments which are sensitive to the forces and/or values involved must be used, to detect what we ourselves cannot sense. The only way these adjustments can be made and checked is with the use of instruments. If instruments are not used it is obvious that precise adjustments are impossible to make.

This writer was in a city of some 200 thousand in California desirous of locating a couple of well equipped shops to obtain photographs. The "Yellow Pages" in the telephone book showed a quarter page advertisement announcing "Tune-Up, Electrical serv-



More and more use is being made of oscilloscopes in engine and electrical tune-up. The 'scope is invaluable for obtaining a quick, overall picture of engine functioning and to ferret out lurking ignition trouble.

A useful combination of voltmeter and ammeter with built-in resistors and switching. Practically all important tests can be made on the generating system besides many voltmeter applications.

ice, and other services". Going to the shop or garage of the advertiser, it turned out to be a disappointment with not a single instrument in sight. The operator was asked about the instruments he used. The answer, "Naw, we don't go for that. There's a couple of places down the street that fall for that kind of stuff." These shops where found, and were using their modern equipment to good advantage.

VOLTMETER VALUABLE "TOOL"

Out of the array of useful and valuable test instruments that are available the single one that has the greatest utility and can be used to find the greatest number of troubles, actual or impending is probably the voltmeter.

The instrument is always connected in parallel and its indication represents the voltage drop or voltage difference between the two points contacted by the meter leads. This is all you have to know in order to use this versatile instrument so that there is no excuse for not using it. Since a few tenths of a volt will often make a considerable difference in the action of an electrical circuit, the voltmeter can be profitably used many times to locate the source of unsatisfactory operation. While many examples of the application of the voltmeter have come to our attention, we will mention two that are of interest.

The purchaser of a new Ford Six took delivery of the car and proudly drove it away from the dealer's service shop where it had been checked over and prepared. Within a mile the engine suddenly stopped and would not start again. The owner, filled with disappointment, got to a telephone and called the dealer, telling him about the car. The shop tow truck was sent and the machine was hauled back to the shop. It was late in the day and the trouble was not investigated until the next morning, at which time the engine started up readily and apparently ran in the normal manner. Therefore the owner was called and told to come and get the car. This he did. Unfortunately a mile or so from the shop the engine died again and could not be started. The routine of calling the shop and towing the car back was repeated.

When the car arrived at the shop there was no difficulty in starting it up so it was assumed that nothing serious was wrong. However, to be on the safe side, a mechanic took the car out for a road test. He got about two miles from the shop when the engine died as it had previously and nothing the mechanic could do on the road would get it started again. So for the third time the vehicle was towed back to the dealer's establishment. This time the ignition timing, dwell, spark plugs and wires were checked. Nothing unusual was found.

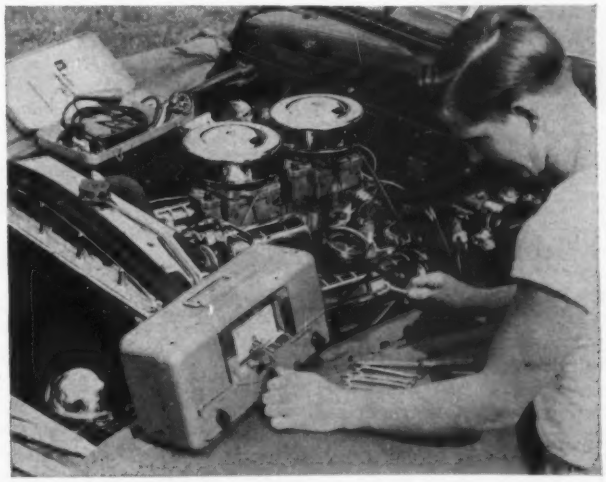
The dealer, too, was consulted to help decide what to do about the car. Naturally he was somewhat peeved at the shop crew who could not find the cause of the trouble, but as there was an independent service shop nearby, which had a good reputation for shooting troubles in the power plant, pride was swallowed and the car sent there.

After a routine check of dwell, timing, and battery the trusty voltmeter was put into action. After determining a few voltage drops, which were found to be normal, a drop of 0.4 volt was observed in the ignition primary ground circuit. This led to a careful check of the distributor. There it was found that the grounding pigtail had the usual terminal on the end, but while the terminal was crimped around the insulation it did not make electrical contact with the metal conductor. The effect was to make the current from the stationary contact point find its way to ground through the breaker plate and its bearing instead of directly to ground through the pigtail.

TOO MUCH RESISTANCE

Apparently when the engine was cold there was a good enough ground, so the ignition system could fire. But, when it got warmed up there was too much resistance and the ignition failed. Then when the engine cooled off it would start up again. The boys in the dealer's shop didn't think to use the voltmeter or they could have found the trouble themselves *the first time the engine stopped.* As is generally true, with the cause of the trouble found—by making the most of instruments—the remedy almost always is a simple matter.

Another instance was that of an owner of a late model V-8 who complained about having to replace distributor contact points much too frequently. The shop where he had his service work done kept putting in new points but apparently was not able to find out why they lasted such a short time.



Instruments that are sensitive to forces and values must be used to detect what technicians themselves cannot readily sense.

A time-saving and profitable instrument is the cylinder leakage tester. It pinpoints the leakage path of gases from engine cylinders.

The car owner was telling his troubles to a friend who referred him to a shop which made prolific use of instruments and testing procedure. So the customer with the troublesome points took his car to the recommended shop. There the first thing they did was to use the voltmeter to check the ignition system voltage at the battery side of the coil. They found that the coil was getting full generator voltage whereas it should only have been energized a maximum of about 12 volts.

Either the ballast resistor had been by-passed or the by-pass that is used for supplying full battery voltage during the brief period when the cranking motor is working, did not cut out when the starting circuit was broken. In either event the reason for the trouble with the points was simply too high voltage. Correcting this condition remedied the trouble and the points from then on performed adequately over their normal life span. Once more use of the voltmeter easily located the trouble and, of course, the remedy was self evident.

Many more instances of the use of this valuable instrument could be given but the two cited illustrate how important it is to use it. It is used to locate high resistances, excessive voltage, to check generator voltage and set the voltage limitor, to check battery voltage, etc. A defective ignition switch can be located by connecting a voltmeter lead to the battery side of the coil and to ground and wiggling the ignition key in the lock. If there is any variation in the voltage it is due to a poor contact inside the switch.

A Companion to the voltmeter is the ammeter. This instrument must always be connected in series so that the same current which flows in the circuit will flow through the meter. Naturally in order to insert the ammeter it is necessary to break the circuit in which the current flow is to be measured. This instrument is not used nearly as much as the voltmeter but it is a most useful instrument. It is essential for testing the generator circuit, for making tests on the battery, for testing the current draw of various accessories and of the cranking motor.

The voltmeter and ammeter are frequently combined in one case. A useful arrangement is one where the two instruments are built into a single case along with a variable resistance and one or two fixed resistances. Internal switching arrangements allow for a complete check of the generating system in a few minutes. The voltmeter should have several scales such as 0-3 or 0-4 for low voltages, 0-8 for 6-volt systems and 0-18 for 12-volt systems. For 32-volt systems a higher reading scale is necessary.

Another combination is the battery-starter tester which has a voltmeter and heavy-duty ammeter plus a carbon pile rheostat which can accept over 300 amps. for a short time. This is useful for the battery capacity test, which is sometimes called the "breakdown" test.

CAM ANGLE METER

Another essential instrument is the dwell meter or cam angle meter. This is connected either to the distributor side of the coil or to the distributor terminal and operates on the electrical impulses in the ignition system when the distributor contact points open. During the time the points are closed the only voltage on the instrument is that due to the resistance of the points and the ignition ground circuit. When the points open the full voltage on the coil will actuate the instrument.

Where new points are put in it is possible to use a feeler or thickness gauge of the correct thickness and set the points by this means instead of

This recently introduced scope analyzer uses a plug-in connection, enabling the operator to make one master connection on a pre-wired car for testing and tuning.

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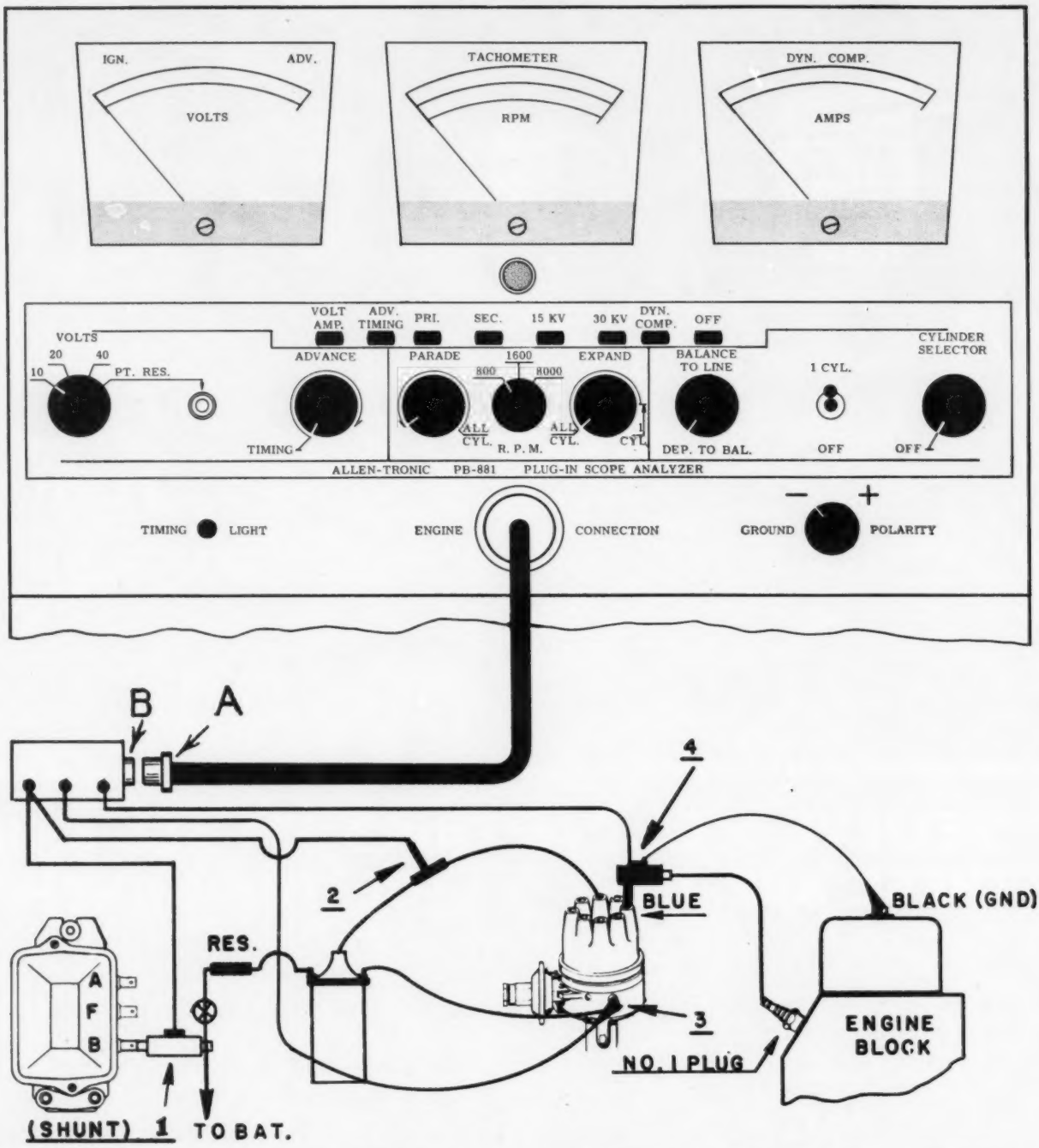


Panel and connection details of scope-analyzer. Car can be prewired so single connector A, is inserted into receptacle, B, latter being permanently mounted in engine compartment. 1—volt-amp measurement; 2—Secondary scope patterns; 3—primary scope patterns and point resistance; 4—No. 1 plug, tachometer, timing and advance.

using the dwell meter. But the meter is more convenient and it's easier to get a correct setting. In the case of points that have seen some use and have some metal build-up on one point, the feeler gauge cannot be used accurately.

A point that cannot be overlooked is that changes in dwell affect ignition timing. One degree change will cause a change of approximately one degree in the time the ignition occurs. Therefore, every time points are installed in a distributor, or dwell is changed, the ignition timing should be checked and corrected to factory specifications.

This brings us up to the timing light. Every shop that has anything to do with engine service must have a timing light. While the neon light actuated by the high tension ignition current can be used, it is far better to use a power timing light which gives a brilliant white beam. This is the accepted method of checking ignition timing in this country. In the case of the import cars, timing is often set with the engine not running, but using an indicator light in series with the points, the light will go out when the points open. A similar light in parallel with the points will light up

The armature growler is needed by every shop that aspires to do generator work. It is a practical means to test armatures for shorted coils.

when the points open. This makes it possible to check the ignition timing without a timing light, though the timing light is much more convenient and easier to use.

In connection with tune-up work, the distributor tester or distributorscope is a necessity. Tune-up men who do a conscientious job are agreed that the only correct way to check and service a distributor is to remove it from the engine and install it on the distributor tester. In this way it is easy to put in new breaker points and condenser and to accurately set the dwell. Dwell variation can also be checked and this may be an important measurement if there is excessive wear in the distributor. The firing pattern is easily checked, and this will show up unequal wear on the distributor cam and excessive distributor shaft bearing wear. It will also show up distributor point bounce which at times may be troublesome. While the distributor is on the tester, breaker arm spring tension can be measured, and should be.

The performance and economy of the engine depend on the correct performance of the distributor automatic and vacuum advance. The advance curves should always be checked on the tester, and if not in accordance with factory specifications, correction should be made. This is a most important, functional test. Many cases of ruptured vacuum advance diaphragms have been revealed on the distributor tester with decided improvement in engine performance.

It is possible, with the electronic distributor tester to make some tests of the distributor on the engine, by checking the total advance at different speeds then disconnecting the vacuum line, rechecking and subtracting the automatic advance from the total advance to get the vacuum advance. However this method is not as convenient or accurate as the distributor tester.

Whenever the distributor is removed from the engine and replaced, especially with new points, ignition timing must be checked and corrected to agree with factory specifications.

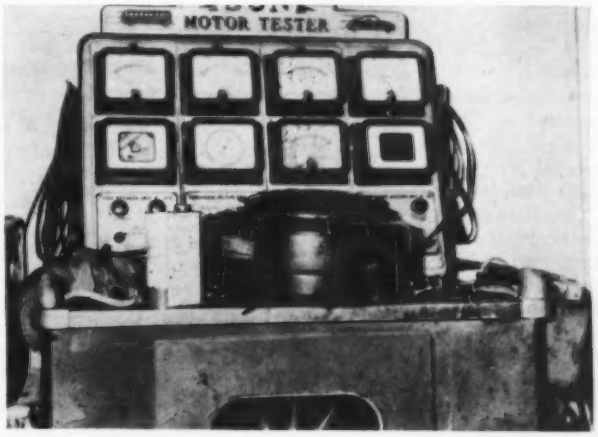
In many cases new points are put in without removing the distributor from the engine and the engines will run. In probably half of the cases the operator of the car will not know the difference and as long as the engine runs somewhat better than it did before the tune-up, he is satisfied. But in the rest of the cases the engine will not perform as well as it should nor will the points last as long as they should. The advance curve cannot be checked unless the electronic distributor tester is used. Generally, when the distributor is not "pulled" the operator will not bother to check anything more than he absolutely has to.

THE OHMMETER

For operators who want to be well equipped for diagnosis and trouble shooting the ohmmeter is a useful instrument which can be used to good advantage. The ohmmeter depends for its measurements on a self-contained battery so it is not necessary to have circuits alive when ohmmeter measurements are made. In fact the circuits or appliances where resistance is to be measured must definitely NOT be electrically alive, as the instrument will be damaged if this is the case.

New ohmmeter models are available with several different scales so they have a wide application. The ohmmeter can be used to check resistors, resistor type spark plugs, generator field coils, ignition coil secondaries, diodes in alternators, etc. The utility of this instrument is not as yet fully appreciated. It should be more widely used.

One of the newest additions to the instrument field is the automotive type oscilloscope. The way this device is used varies considerably in the various shops where it is included in the instrument equipment. In some cases every car that comes into the shop for a tune-up is connected to the oscilloscope to see just what the picture shows and to get an idea of what is needed. In other shops the scope is only used to assist in diagnosing troublesome cases. In any event the oscilloscope is a valuable tool in connection with the analyzing of the action and performance of the ignition



Here is a pitiful case of a good investment going to waste. This analyzer has a broken glass and the rest of the instruments have been neglected, are dirty and cannot be read. The shelf is cluttered. A good example of how not to treat testing equipment.

system. We all know that good and dependable as this system is, it is the most sensitive and most likely to be beset with trouble of the three performance factors compression, carburetion and ignition.

The most important thing to say about the 'scope is "Use it!" Shops which do not have it available are missing a valuable helper and those where it is on hand are overlooking a good bet if they do not make frequent use of it.

CYLINDER LEAKAGE TESTER

An instrument which is beginning to get the recognition it deserves is the cylinder leakage tester. For the first time some of the car manufacturers are recommending it in their factory manuals, Chevrolet, for example. For any shop where valve jobs and overhaul work are done or wanted, as well as where accurate diagnosis is desired, the cylinder leakage tester is the answer.

Its outstanding value lies in its ability to pinpoint the leakage path of gases from the engine cylinders. It works by applying a controlled air pressure to a cylinder with its piston in TDC (top, dead center) position, through a carefully calibrated orifice. If there were no leakage from the cylinder the pressure would remain constant and the pressure gauge, calibrated in percent of leakage, would show zero. However, there is always some leakage, and as the air escapes faster than it can come in through the calibrated orifice the pressure in the cylinder will drop in proportion to the rapidity of the leakage. The pressure gauge indicates the pressure in terms of percent of leakage.

To determine where the leakage takes place, if it is past the intake valve it can be heard by listening at the carburetor with the air cleaner removed. If it is past the exhaust valve it can be heard by listening at the tail pipe. If it is past the rings it can be heard by listening at the oil filler pipe leading to the crank case. In the event of a bad head gasket, bubbles can be seen and heard at the radiator filler neck. The instrument is used by making finger-tight connections to each spark plug hole and putting the corresponding piston in TDC position. This is easily done by using the several simple devices that are supplied with the instrument.

Comparatively few instruments are used singly as generally there are from two to a whole bank of instruments combined together. The so-called Engine Analyzer has an impressive cabinet and instrument assembly which may comprise a coil tester, condenser tester, vacuum gauge, tachometer, dwell meter and combustion analyzer. A volts-amperes tester is contained in the cabinet along with the power timing light and several accessories.

One shop recently visited had such an expensive unit shoved against the wall, from where it had not been moved for some time. The glass in one of the instruments was broken and the rest were so dirty that the dials could not be read. The shelf in front was piled high with junk, indicating that it had not been in use for a long time. In this case the investment was useless instead of being a means of increasing income. Instruments are no good at rest.

Some of the later instrument combinations have somewhat greater utility, such as analyzers with a built-in oscilloscope. With this instrument setup just about all the important tests can be made. Various combinations by Allen, Hanson, Hyer, Snap-On, King and others offer many excellent combinations.

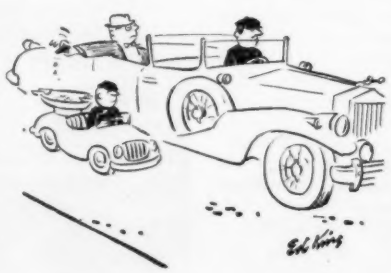
"PLUG-IN" APPROACH

A new concept in integrated tune-up testing with a new "plug-in" approach which adapts itself to a captive customer market has been announced by an equipment maker who says of it:

"To recognize the full value of this new approach, let us review conventional test equipment. This type of equipment has not generally been used to its fullest advantage for several reasons. Perhaps most important, the equipment has been difficult to operate, requiring a somewhat broad knowledge of electrical theory, and continuous instruction and re-instruction. The connections were difficult to make, and the results, procedure and sequence of tests, subject to individual pet ideas and interpretation. Also, equipment of this type has appeared in separate cabinets or cases, and has therefore, been somewhat cumbersome in daily shop application.

"In talking of the assets of equipment, we must recognize the lack of features which would encourage repeat customer business. We feel our new design is a solution to several problems of test equipment use.

"The main features of our new approach are: A single unit design, which incorporates all recognized electrical, ignition, and electronic compression tests, with other necessary test functions in one unit, that can be used with one hook-up.



"This simplified hook-up design is much faster and more convenient to use, and goes a long way toward insuring the consistent use of the equipment once it is installed.

"We stress a new important feature and refer to it as a captive customer concept. Regular maintenance tune-up is widely recognized as the best insurance of peak automobile performance. Properly handled, it should be economical for the car owner and profitable for the service organization.

"The simple addition of an inexpensive, permanently installed harness allows service technicians to make a routine check of each car at regular service intervals. Given a warm engine, the analyzer can be plugged in and a complete test sequence run in a few minutes. The wiring harness is relatively inexpensive and is installed externally to the engine itself. The female receptacle and junction box is placed in any convenient location under the hood."

Most of the car manufacturers have launched service plans to bring cars "home" for service and insure top performance. This, coupled with the 12,000 mile/12 month guarantee programs, offers car owners an understandable bonus in driving pleasure. Adding tune-up checks to routine service gives a physical focus to these service programs.

Looking for a Job? Use our Classified Columns—Page 80

Lets bear in mind the fact that no instrument is any better than its operator. Unless instruments are used they are no better than so much material. One thought that we hope to put over in this discussion is that money spent for instruments is a profitable investment *provided* the instruments are used. Instruments should be money making equipment and will be if their potential value is realized by using them as their makers have designed them to be used—and understood.

It is generally known that there is a considerable amount of dissatisfaction with automotive service because of the relatively large number of unsatisfactory "tune-up" and adjustment jobs that have been done. Car owners don't like to spend more money than necessary. But when this money is spent for repair service where the faults are not corrected, their faith in shops goes down. Those shops where troubles are really corrected, by making the most of instruments, are building up their volume of business and number of satisfied customers.

DITZLER SHELF-SHOP MIX. For the shop with limited shelf space. This compact unit comes in two sections. Requires only 16 sq. ft. of floor space, and wall space just 8 ft. wide and 7 ft. high. Can be used in straight line or in corner.

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The body shop

APPEARANCE MAINTENANCE

Principles of body-frame straightening

• THE BODIES OF CARS of recent vintage in many cases employ an integral construction which eliminates the former conventional type of separate chassis frame. It is called "unitized" body construction. The Valiant, for example, is typical of such construction.

Thus, the body and frame of the Valiant are combined into a welded and reinforced shell of considerable strength and twist resistance. Sturdy reinforcements are used throughout the lower body structure to carry driving, braking and suspension loads. They are formed of heavy box sections which distribute the major road forces to broad areas of the body structure. The box sections also provide solid supports for the bumpers, springs and shock absorbers.

PROVIDES MAXIMUM STRENGTH

All doors pillars, sills, roof rails, windshield headers, and belt line rails are fully boxed to provide maximum strength. The heavy gauge front fender side shields are welded to the dash panel, side sills and radiator yoke to form a rigid front end structure. The deck lid and hood are reinforced for greater strength, rigidity and twist resistance. More than 5,300 spot welds and seam welds are used to join the many steel stampings which make up the body structure.

Two structural members are bolted in place. One is a K-shaped engine support crossmember, and the other is the short member which supports the transmission. The non-structural parts like the front fenders and the grilles are not welded in place, but are attached with bolts thereby providing ease and low cost in replacement. Bodies, incidently are subjected to a seven-stage immersion anti-corrosion and rust-proofing process.

With the ever-increasing growth in the percentage of compact cars and the mounting trend toward larger cars with unitized body-frame construction, the profit opportunity in straightening unitized bodies becomes correspondingly greater.

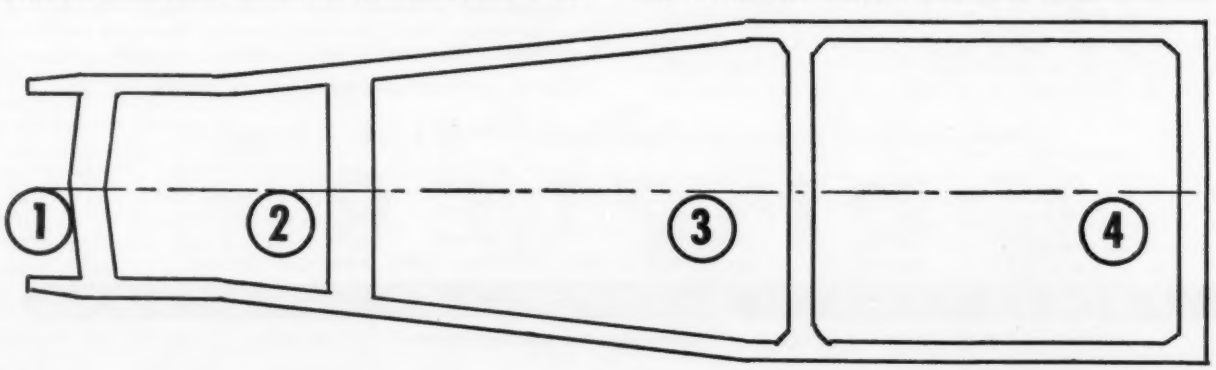
BASIC PRINCIPLES APPLY

It is stated by frame alignment equipment makers that an education and experience in conventional frame work qualifies the frame straightening specialist for unitized body work. This is true because the basic principles which apply to frame straightening also apply to the unitized body.

To take full advantage profitwise from all that body-frame straightening holds now and in the days to come, the body shopman and those coming up through the ranks, must understand the fundamental principles involved. Likewise, shops must have the right kind of equipment on hand to make pulls on pinch weld and sheet metal.

Over a period of many years one manufacturer of body straightening equipment, Bear Manufacturing Co.,

One approach to body-frame straightening emphasized by an equipment manufacturer includes four controlling points of any passenger car frame. These are (1) front cross member; (2) cowl area; (3) rear door area; (4) cross member behind fuel tank.



has come up, for example, with pertinent facts worth passing along to bodymen, be they old timers in the field or comparative newcomers.

TWO FUNDAMENTAL APPROACHES

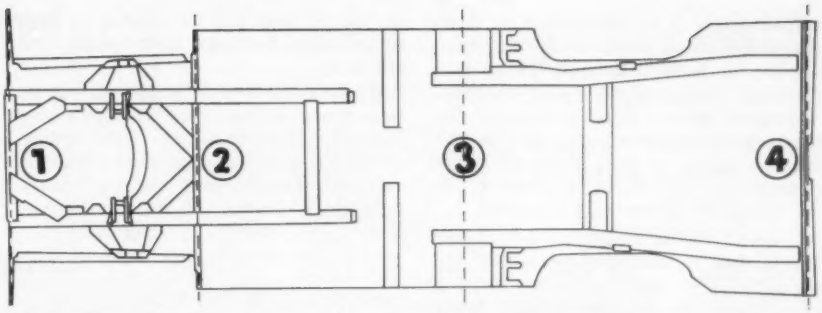
Two fundamental approaches toward straightening bodies and frames are given by this manufacturer.

We learn that one approach is designed to aid all frame operators as a practical on-the-job guide that precedes the actual straightening process. This is called the "key" to body-frame straightening and is divided into three basic steps. These are:

Diagnosis—A detailed appraisal to determine the exact body-frame misalignment conditions.

Preparation—Make-ready of the vehicle.

Hook-Ups—Set-up of jacks and hold downs before application of pressure, pull or power to correct distortions.



The modern unitized body has a "frame" and is treated in much the same way as conventional frame construction vehicles. Shown above are the four controlling points of straightening.

The second fundamental approach is directed toward establishing a basic understanding of frame construction as it relates to body-frame straightening. It is known as the "Four Controlling Points."

The four controlling points of any passenger car frame are:

1—The front crossmember
2—The crossmember at the cowl
3—The crossmember at the rear door
4—The crossmember behind the fuel tank.

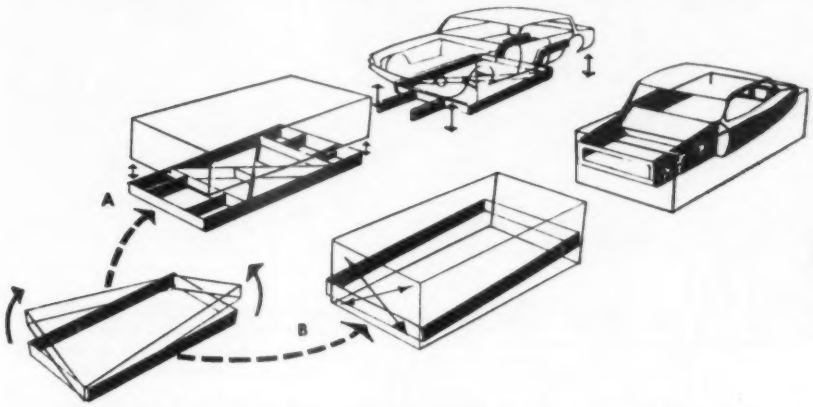
For the purpose of understanding, a frame theoretically is divided into sections. It establishes the basis for all frame straightening procedures:

1—Collision damages occur at the controlling point. Upon impact both frame side rails will move together. The one possible exception is the direct impact incurred in the side of the vehicle. Where crossmembers do not exist at a controlling point, the controlling points are referred to as areas; that is, cowl area, rear door area, etc.
2—The frame centering gauges for the purpose of frame diagnosis are positioned at controlling points.
3—Hook-ups and correction pressures are applied at controlling points, rarely in between.

The advent of the unitized all welded-body frame vehicle has not changed this fundamental approach. The unitized vehicle does have a frame and is treated in similar manner as conventional frame construction vehicles. The four controlling points still apply.

The basic difference between unitized and frame construction vehicles lie in their correction procedures. Collision damages on unitized construction require both the body and the frame to be straightened and aligned simultaneously.

During unitized vehicle straightening procedures, the modern frame operator must be able to determine when the body and/or body panels are in correct alignment. "X-ing" type measurements are the most popularly practiced. Body dimensions covering trunk openings, door openings, floor panels, roof panels and cowl panels are usually available through the car manufacturers.

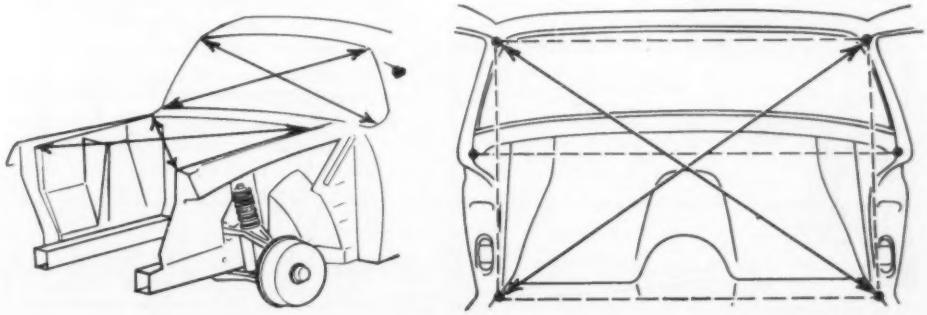


The lower half of the unit must be stiff and strong when frame structure A is used to support the body and running gear. Unitized bottom section B can be kept light, as it depends on upper half of body to complete the box section structure. Welding, in place of bolts and nuts, reduces rattles.

TYPE OF BODY-FRAME MISALIGNMENT

Body-frame misalignment may be divided into five types:

1—Sidesway
2—Sag
3—Mash
4—Diamond
5—Twist



Typical measuring points during unitized vehicle straightening procedures. Body shop operators find "X-ing" type measurements accurate and easy to make.

Each type of misalignment is illustrated on these pages and each type applies to both orthodox frame and unitized construction motor vehicles.

Sway is lateral misalignment of the frame and shows up in a greater or lesser degree on both siderails. This depends upon the direction from which the collision impact was received.

Siderail sag is misalignment of the frame due to buckling of either the right or left siderail upon impact. Weight of the engine or car body causes the siderail to drop.

A mashed frame and buckled siderail result from a heavy impact. In addition to siderail sag and buckling on top of siderail, the frame is bent down and buckled underneath the siderail.

A diamond frame results from an impact on either corner of the car frame, sufficient to push the crossmembers out of right angle to the side rail. A twisted frame results from a collision when there is an extra heavy load on the chassis causing it to turn over, or tending to turn it on its side.

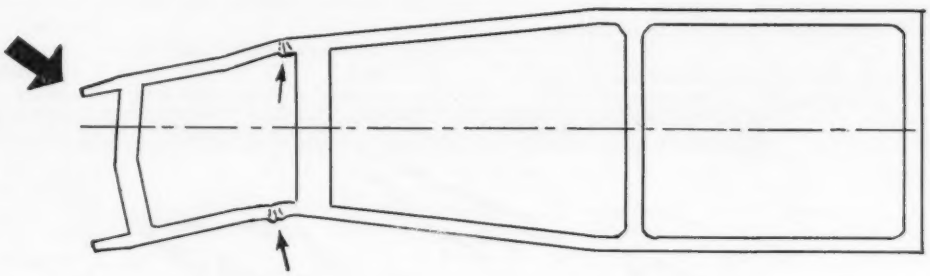
NO ACCIDENT IS TOO SLIGHT

An automobile involved in an accident, no matter how slight, should have a complete body-frame alignment appraisal. The severity of the impact will determine the extent of damage.

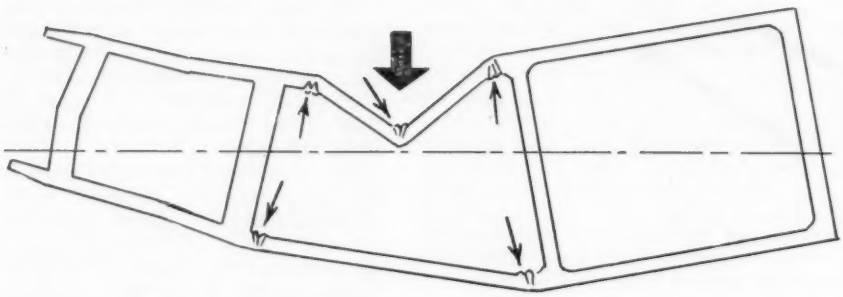
Whenever a vehicle, both conventional frame as well as unitized, has been struck in the front, the following order of occurrence of frame damage may be expected.

1—Sidesway 3—Mash
2—Sag 4—Diamond
5—Twist

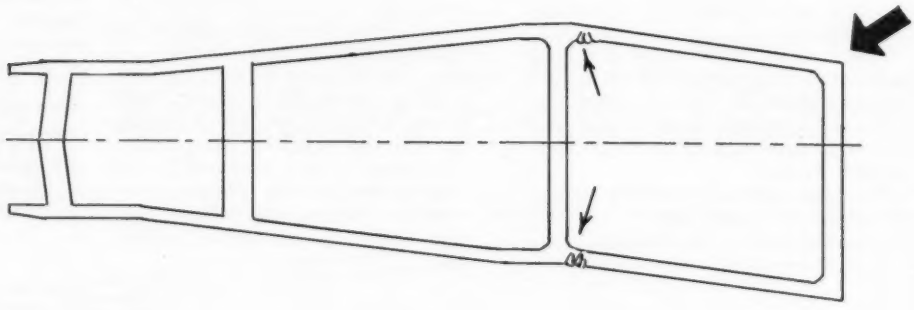
Sidesway, being the easiest condition to occur in passenger car frames, can be expected regardless of the severity of the impact. Sag occurs when the vehicle is involved in a more severe collision with mash occurring if sidesway exceeds ½" or if sag exceeds



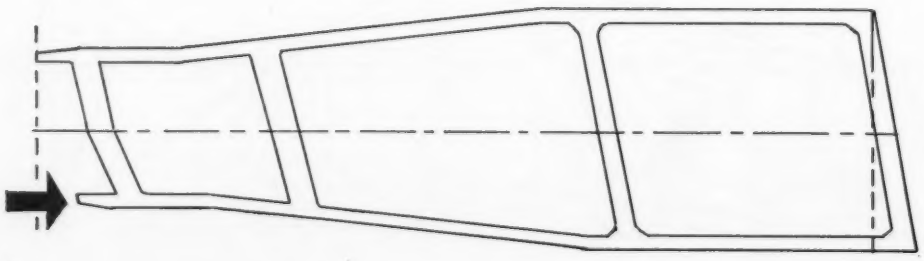
Sway from front end collision. Heavy arrow indicates direction of impact; light arrow, indicates buckles in side rails.



Sway from collision in center; direction of impact shown by heavy arrow. Sway is a lateral, misalignment of frame.



Sway resulting from rear end collision. Sway shows up in both siderails, depending upon direction of impact.



Diamond frame results from impact on either corner of frame. Crossmembers are out of square with side rails.

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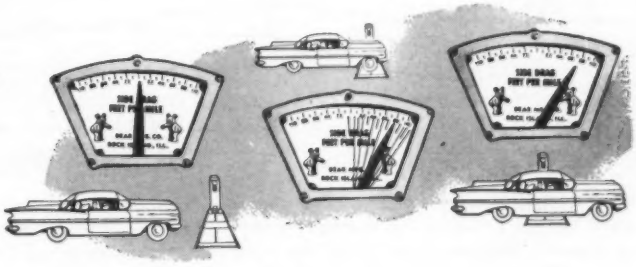

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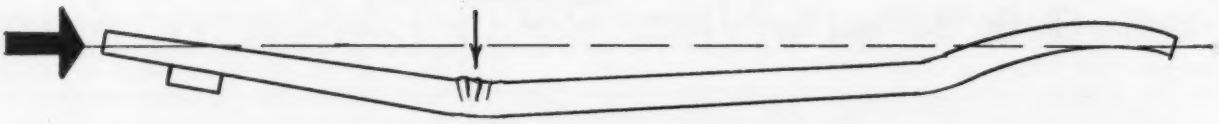
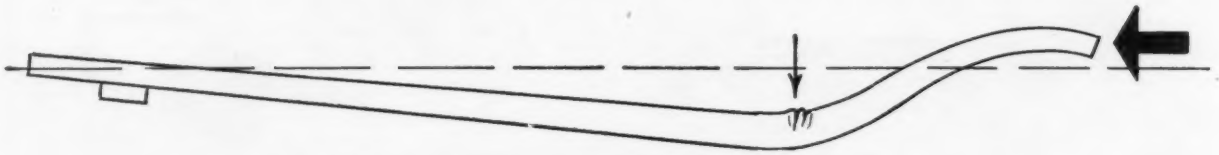
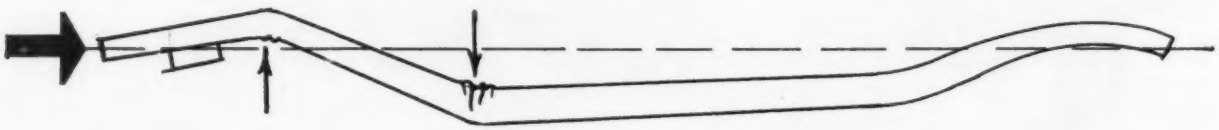


Siderail sag resulting from a front end collision. Heavy arrow indicates direction of impact; light arrow indicates buckles in side rails.



Siderail sag due to rear end collision. This type of sag is due to buckling of either the right or left siderail upon impact.



Frame mashed and buckled from front end collision. A mashed frame and buckled siderail results from a heavy impact.

Frame mashed and buckled from a rear end collision. Heavy arrow shows impact direction; light arrows, buckles in siderail.

Twisted frame which results from a collision when there is a very heavy load on the chassis, tending to tip or overturn it.

3/8". Diamond and twist follow in a very severe collision on certain types of frames. Diamond and twist do not ordinarily occur on unitized vehicles or X-type frames.

Whenever a vehicle with conventional frame construction has been struck in the rear, the following order of occurrence of frame damage may be expected:

1—Mash; 2—Sidesway; 3—Sag

A possible fourth condition might be twist. With extensive body damage a slight twist might be expected. However, very little attention is devoted to this type of twist because it is usually non-existent after mash and sidesway have been removed. The possibility of diamond occurring when a vehicle is struck from the rear is rare. The rear part of the frame is "elastic" and will absorb a very severe shock.

Unitized vehicles, when struck in the rear, will follow the same order of occurrences of frame damage as those occurring in the front:

1—Sidesway; 2—Sag; 3—Mash.

A tip from those in the know on body work points out that the unitized body does not have to be over-corrected as much as conventional frames for flex-back. Also, for best results, a body man, if possible, should work with the frame man to remove damage simultaneously from unitized construction.

New Points Call for Gap Set on High Side of Range

When installing new distributor points, Champion Spark Plug Co. advises setting the breaker point spacing on the high side of the tolerance range so as to compensate for slight rubbing block wear which occurs while it is seating itself on the cam.

As the block seats, it may wear enough to throw the point opening out of the tolerance range, retarding spark timing, should the opening be set to the low limit.

Setting the gap on the high side of the range eliminates this possibility since slight rubbing block wear will simply bring point spacing closer to the middle of the tolerance range.

Obviously, if a dwell meter is used to adjust point spacing, the points should be set on the low side of the dwell tolerance, for the same reason.

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TOTAL $

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This estimate is based on the initial inspection. It does not cover additional parts or labor that might be required after the damaged sections have been removed. Occasionally, new or damaged parts are found after work has been started which were not evident on the initial inspection, in which case the insurance company will be notified.

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Remarks ___

Total Parts Prices ___ $

Total Body Labor @ ___ Hour ___ $

Total Mech. Labor @ ___ Hour ___ $

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Ignition systems of the future

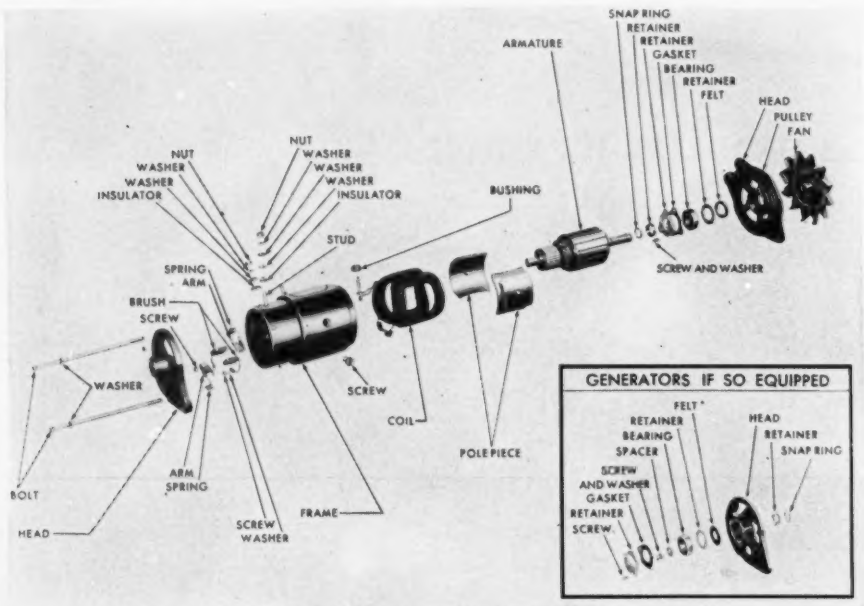
Continued developments in the field of electronics is playing an ever important role in the automotive ignition, starting and lighting systems. The alternator is already replacing the generator, and in the not too distant future, "breakerless" ignition systems will eliminate points, coils and condensers altogether.

• RECENT AND IMMINENT developments in the electronic field as related to automotive transportation units are actively in the process of revolutionizing not only automobile ignition, starting and lighting but also all phases of electrical applications in the highway transport, marine and industrial fields.

Some of these developments are with us at the moment and are actually being applied to the 1961 models, as for instance the alternators used on all Chrysler products in place of generators. Others are somewhat more remote but developments in this field of electronics have shown so much promise that their eventual use seems assured. To cite an example of this we have the fuel cell which is engaging the attention of engineers and scientists. This latter development, if carried to the conclusion which some of the more enthusiastic researchers predict, will introduce radical changes even to the extent of possibly bringing back the electric vehicle. Even now this is being studied for such uses as taxi cabs and urban passenger transportation.

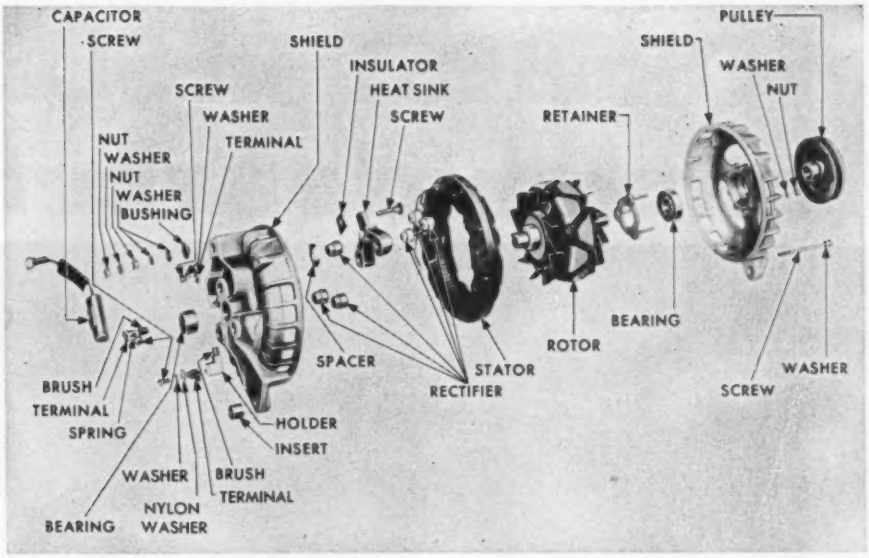
NEW IGNITION DEVELOPMENTS

The most immediate, and in fact current, use of the new electronic developments as a part of the automotive industry is found in the ignition field. We start here with the alternator which actually has been in use in one form or another for about 30 years. The alternator is just another form of generator and performs the same function. The difference between the two is that the alternating current produced by the generator, of the type that we have become used to over the years, is rectified by a mechanical circuit breaker which permits only one phase of the alternating current to pass, thereby



Exploded view of a modern generator.

By J. EDWARD SCHIPPER
Detroit Editor



Exploded view of Chrysler's latest alternator.

changing it into DC. With the alternator, rectification of the current is accomplished electronically by means of semi-conductors which allow current to pass only in one direction while offering high resistance to current in the other direction, thus resulting in the desired DC.

LARGE, HEAVY AND EXPENSIVE

The reason this 30-year-old development was not adopted for general use a long time ago was because the electronic rectifying unit was a large, heavy and very expensive piece of equipment. This picture has been changed by the recent introduction of small, and relatively inexpensive, semi-conductors. These include the transistor, which has now become almost a household word, and the lesser known, but equally important, silicon diodes, not much bigger than a stack of four nickles. These successfully permit only one-way traffic for electrical currents.

The perfection of these new products has made it possible to produce alternators which cost no more than the previous type of generator with its regulating equipment. For example, on the Chrysler parts market, an alternator will sell for around $35 for all models except the Imperial and the somewhat heavier duty job for that car costs only $3 or $4 more. This is just about the same price as the generator plus its regulator. As far as weight is concerned, the alternator weighs only 12¾ lb., which is 9 lb. lighter in weight than a conventional generator.

While Chrysler has taken the lead on the introduction of this new unit, it can be confidently predicted that it will be generally adopted throughout the industry. For several years, alternators have been installed on many makes of cars for heavy duty use, including the cars used by the police who patrol the expressways and super highways. It has also been used by fire departments and certain heavy-duty haulers. These installations, however, have been far more expensive than the current models made possible by the new types of semi-conductors. The alternator which has been frequently described lately in detail, is typical of the electronic products which have been made possible by the silicon diode semiconductor. Summing up the advantages for the alternator vs. the generator, Chrysler Corp. puts it as follows:

ADVANTAGES—ALTERNATOR VS. GENERATOR

High Output	**7-10 Amps at Idle**	**No Charge at Idle**
Light Weight	**12¾ lb.**	**22 lb.**
Long Life and Reliability	**Longer brush life**	**Shorter brush life**
	Needle bearings	**Sleeve bearings**
	Stationary armature	**Rotating armature**
	Slip rings	**Commutator**
	Silicon diode	**Current breaker**
	Self-regulating current	**Requires current regulator**
Battery Condition	**Higher charge**	**Heavier drain**

Adding up to surer starts; fewer stalls; longer battery life.

OTHER MANUFACTURERS NOT IDLE

While Chryselr Corp. has been first to introduce the alternator on its cars, other pioneers have been busy on developments. Delco, for example, has supplied alternator equipment for heavy-duty and specialized purposes now used in many such installations throughout the country. Autolite has been a leader in the development of the alternator and is a strong believer in its future.

Quoting James Gage, chief ignition and control engineer for Autolite, "1961 brought with it a decided push to the alternator for electrical system power generation. The alternator brings with it a widespread usage of another semi-conductor device in the automotive industry—the silicon diodes which rectify the alternating current produced by the alter-

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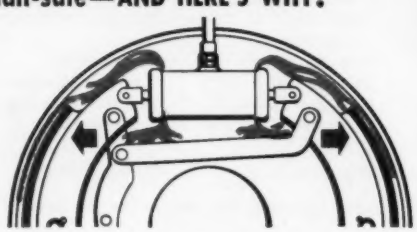
on vehicle whenever

Brake jobs that do not include wheel cylinder inspection and service are only half-safe—AND HERE'S WHY:



If a worn cylinder is not repaired or replaced, brake fluid may leak out, causing:

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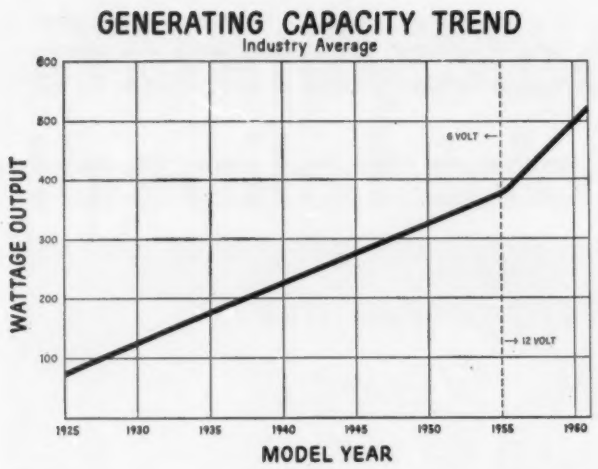


How demands on the battery and generator have increased.

nator, following the highly successful transistors used in automotive radios. The alternator appears to have gained a permanent and increasing usage because of its high output at engine idle and long-lived slip-ring assembly over the commutator. Alternator voltage regulators are of the more economical vibrating contact type but considerable effort is being expended on development of static semi-conductor types for the future."

In his statement, engineer Gage is particularly referring to the advantage of the stationary armature as used in the alternator over the rotating armature as used in the generator. This eliminates the need of a commutator and particularly provides much longer brush life.

OTHER IGNITION DEVELOPMENTS

Another area where semi-conductors, particularly the transistor, will have a great deal to do with new developments is in the ignition system. Electric Autolite Co., during 1961, will be on the market with a new system to be known as the Transigniter. This is a high-voltage unit using conventional spark plugs, distributor and regulator. However, the transistor, heat sink and associated circuitry replace the conventional coil. What sparks this development is the search that ignition manufacturers are making for longer-life products. The transistorized ignition system is designed to offer this longer life by eliminating "blue points" and assorted other contact ailments common to conventional systems.

According to James Gage, the Transigniter will not only offer these advantages but also will provide higher voltage across the speed range for better firing. This authority credits the further slackening of the horsepower race in 1961 for, "permitting ignition system design engineers to switch emphasis from high-voltage, high-energy ignition systems to longer-lived systems."

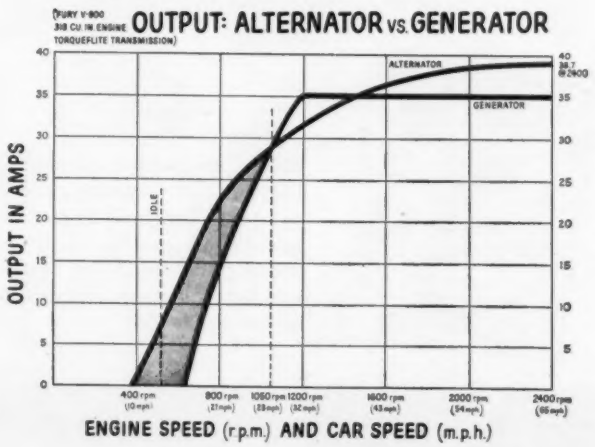
Quietly there have been some very important but not spectacular approaches to this matter of extending the life of the ignition parts. The changes include lower current coils for greater contact life, and longer-tipped spark plugs for greater non-fouling life. As Mr. Gage points out, "increased emphasis on adequate radio interference suppression has caused almost 100 per cent adoption of resistor spark plug cables on passenger cars and light trucks." Where severe vibration or high-temperatures are encountered, the resistance cable is **not** recommended and in this type of installation the less effective but more durable resistance distributor caps and resistor spark plugs are employed. Many engineers are hard at work on the development of more rugged means than the resistance cable which contributes so heavily to short-system life.

ONLY 10% OF PRIMARY CURRENT ENTERS POINTS

Another interesting electronic ignition system has been developed by the Tung-Sol Electric Co. This is at the present time, a rather expensive system but is claimed to have superior qualities, particularly of long life. Several of these are now on test by automobile manufacturers. The system eliminates the coil and the condenser. This is replaced by a thyratron tube, germanium power transistors and silicon diodes. This combination is claimed to develop a more rapid development of the peak current impulse reaching the spark plug. In the conventional system from 60 to 120 thousandths of a second are required for the build up of the impulse before the spark is delivered at the plug.

With the Tung-Sol system, the impulse is claimed to reach a peak in from one to two-thousandths of a second. In this system, less than ten per cent of the primary current is claimed to pass through the breaker points, although the spark delivered is claimed to be more intense, giving improved combustion with a corresponding reduction in unburned hydro-carbons in the exhaust. Net result, according to Tung-Sol, is a possible satisfactory performance for about 100,000 miles without intermediate tune-ups.

Charging characteristics of alternator vs. generator.



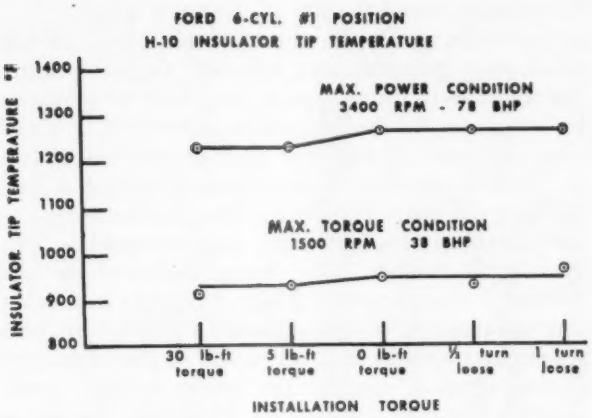


Chart showing the effect of spark plug installation torque on spark plug operating temperature. Actually, most of the heat is dissipated through the steel shell, not all through the gasket, as is often diagrammed. While the effect of installation torque on plug temperature appears negligible on the chart, the fact cannot be overlooked that there could be serious chemical corrosion on the threads, the gasket and gasket seat if the plugs are put in loosely. Therefore, spark plugs should always be installed with "reasonable" torque.

ELIMINATES POINTS AND CONDENSERS

At the recent S.A.E. convention at Detroit's Cobo Hall, Delco-Remy Division of General Motors disclosed the successful development of a "breakerless" ignition system which eliminates contact points and condensers through the use of a pulse-controlled transistorized unit.

The pulse-controlled unit is not subject to the wearing, pitting and oxidation which is characteristic of contact points in the conventional distributor, and which has always required periodic replacement along with the servicing of the ignition system.

One of the electronic system's first test applications has already run 5,000 hours and is still in operation without need of ignition maintenance.

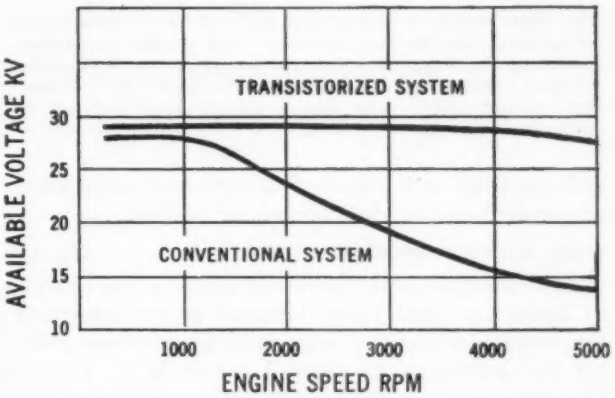
SPARK PLUG DESIGN EVER CHANGING

As regards other units in the ignition system, particularly spark plugs, an almost bewildering array of factors are involved. To illustrate this, Champion Spark Plug Co. recently held an ignition performance conference which lasted three days and was attended by engineers from the oil companies, additive suppliers, car, truck and engine manufacturers, engineering and science writers, as well as some two dozen engineering and technical members of the Champion staff. The tremendous amount of detail involved in spark plug design required to keep up with changes in engine compressions, fuels and even the amount of torque applied to the spark plug during installation, can well amaze even the experts.

In the field of spark plugs, probably the most interesting developments electronically are the methods of measuring heat range at various points of the spark plug in order to determine design factors contributing to long life as well as performance. For a long time, thermo-couples have been used to measure temperatures at the tip of the insulator of the plug and these have been developed further to give greater accuracy. In spite of the years behind the modern spark plug, the amount of research going on today is even greater than ever before. Some of the things which have to do with spark plug temperatures, materials, dimensions, etc., are effected by very minor changes of design and equipment. For example, temperature differences as great as 150° at the tip of the plug has been found between 2- and 4-barrel carburetors.

STUCK HEAT RISER EFFECTS VALVE AND PLUG LIFE

Interesting from the service standpoint, it was brought out at this clinic, that a stuck heat riser, particularly in the summer, has a deleterious effect on both spark plugs and exhaust valves. One engineer from Sinclair (R. W. Meals) states: "Heat risers, of course, re-circulate exhaust gas around the intake manifold. Our experience with stuck risers has included some cases where the excessive heat under high-speed, heavy-load operation has completely burned through the casting. This, in turn, shortened valve and plug life and caused pre-ignition.

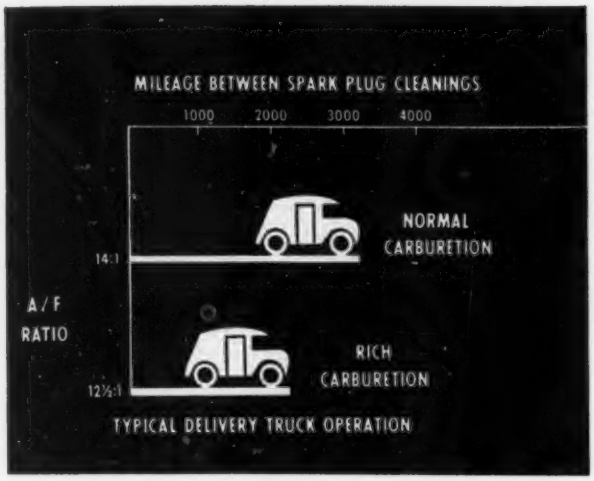


Comparison of Autolite's new ignition system's output with conventional system. Transistorized system output is equal to battery ignition at low speeds and magneto ignition at high speeds.

Another engineer (B. McCormick) of Sun Oil Company, stated: "In the customer complaints that we have handled over a period of years, in 80 per cent of the cases, the heat riser valve was stuck." This situation is cited to point out the fact that the electronics engineer working on spark plug life has many factors to consider outside of the electrical system. It comes down to the point of getting good electrical performance, and this means a hot spark

IS YOUR ADDRESS LABEL PINK?

If it is, it will pay you to turn to page 64 of this issue for an important message.



The effects of varying air/fuel ratio as found from a survey made on a typical city delivery operation. With normal carburetion, spark plug cleaning periods averaged something over 3,000 miles. On those vehicles where the air/fuel ratios were 1 to 1½ richer than normal, spark plug service periods were reduced by approximately 30%.

and good life in the face of all operating conditions on modern engines in all types of service.

SPARK ADVANCE IMPORTANT FACTOR

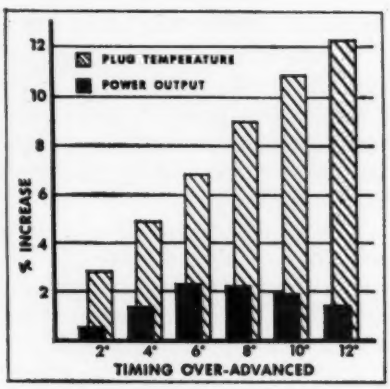
In connection with operating conditions it is well to appreciate that spark advance is an important factor with reference to compression ratio and fouling characteristics. As pointed out by R. C. Teasel, Champion research director; "As far as the compression ratio is concerned, heat range of the spark plug is determined by the net effects of many factors involved in the heating and cooling cycle of the engine. Looking at the thermo couple-spark plugs with the couple embedded in the tip of the ceramic and using special recording equipment, we can actually see the cycle-to-cycle variation of the temperature. Consequently, it must be affected by those factors which affect the heating and cooling in the engine . . . turbulence, charge density, valve location, etc., in addition to compression ratio. When a compression ratio change is made, change in spark advance is also usually involved."

Mr. Teasel goes on to state that the effect of changing the compression ratio varies with different engines so that it is difficult to make a broad statement that compression ratios increase or decrease the spark plug operating temperature. He states it depends largely on combustion chamber configuration, valves and other factors, including carburation. However, the amount of advance is also an important factor. In one experiment going from 10° to 40° spark advance, temperature of the spark plug went up approximately 200° F. In contrast, the voltage requirements dropped from about 10 K.V. to 7 K.V. Thus, changing spark plug advance has an affect both on operating temperature and voltage requirement. This in turn is related to the fouling characteristics and the life of the spark plug.

Commenting on the aims and objectives of the spark plug manufacturer, engineer Gage of Autolite states as follows: "Spark plug wise we continue to design toward the longer-life universal heat-range plug. Actually, in our low voltage ignition system we have exactly that—a non-fouling, universal heat range spark plug. However, there are considerable cost considerations between it and the consumer car. Proto-type systems have been delivered to the military for applications where reliability and other considerations have outweighed the cost factor. This system may well be the forerunner of the multi-fuel engine ignition system. The plugs actually work better when covered with oil. However, the entire system must be shielded, making it expensive for consumer application. This is the system that uses the surface-gap plug."

DEVELOPMENT WORK INTENSIFIED

From these comments it is evident that development work is constantly going on across the entire electronics field as applied to automotive products. Furthermore, it is evident that the efforts have been intensified due to break-throughs, particularly in the methods of measuring localized heat as well as new discoveries in the use of recently developed semi-conductors. The semi-conductor is not a new discovery but it certainly has progressed in the way of reliability without tremendous expense. Many of us are old enough to remember the first semi-conductors with which we had contact when we first used to make little galena crystal-set radios.



Spark plug temperatures skyrocket when timing is over-advanced. Also note the small power increase brought about by over-advancing the timing.

The use of thermo-couples for measuring heat also is nothing new in principle, but in application they are far ahead. The measurement of heat at various points of interest has endless implications in governing design of internal combustion power plants of all types. Another factor which should always be included in summing up developments in the fields we are exploring are the new ceramics and metals which are capable of sustaining high temperatures without losing their physical qualities.

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By C. BUTTS
Houser Engineering & Mfg., Inc.

Springing a good valve job

No one wants to work under tension 24 hours a day, but engine valves must do so . . . and, what's more, they must work under the car manufacturer's correctly specified tension for most efficient power output.

• WHO WANTS TO WORK under tension 24 hours a day? Not most men! But modern, higher compression engines do their best when tension in valve springs is at 100% of the manufacturer's original specifications—and only then.

Change that tension, even a tiny fraction, and the engine in your customer's car is in for trouble. Worn, damaged, hot-running valves are the result. And any mechanic who knows his engines, also knows that loss of compression, power and speed go hand in hand with inefficient valve operation.

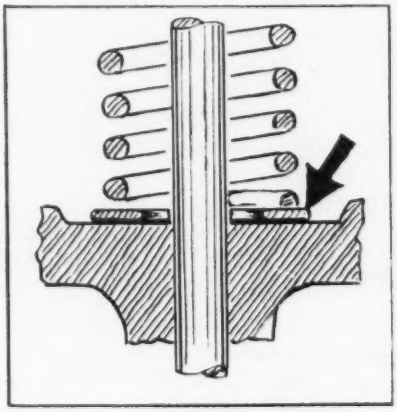


Fig. 1. Arrow shows where valve spring shims are installed. Two thicknesses of shims (.020" and .035") are available.

CHECK VALVE SPRING TENSION

How often has the team of rough idling and fuel waste put customers "on your neck" right after you've reconditioned valves of their cars? Plenty of service departments develop man-tension trying to locate the reason why a car "just won't run right" after a valve job. Maybe right now, you're on a spot like this, so take heart! The cure is sure, quick and easy, if you check the valve spring tension and find that it's either high or low.

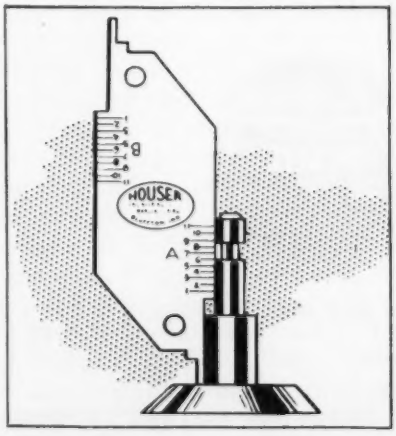
By shimming the valve spring (Fig. 1) an amount equal to the grinding and wear loss, you can restore full and satisfactory engine performance. No doubt you are already familiar with such shims. But you mustn't guess at whether a .020" or a .035" thick shim is needed. Every car manufacturer advises that "guessing is dangerous" because total wear at all points is what governs the replacement needed to restore original factory-specified tension.

GUESS-WORK IS OUT

First off, you must be able to measure the loss of tension accurately to a thousandth of an inch—no guessing! Without accurate knowledge, you may miss again and again. Second, you must understand *why* loss of valve spring tension causes loss of compression, power and speed, and damage to the valves.

Let's take up first things first. The one must necessity is accurate measurement of lost material. This measurement can be made easily by any mechanic. Up to now, a mechanic had to have a "library" of gauges—as many as 24—to measure valve stems on all cars and trucks. Now only two gauges that fit neatly into a pocket wallet work on virtually every car and truck. A little, wallet-sized kit of two steel gauges, one of which is illustrated in Fig. 2, is available and puts precision in your pocket, plus skill in your hands. It holds two gauges, instructions, and a selector chart covering applications for most popular cars and trucks. No disassembly is needed to measure, and a couple of minutes is all it takes to do an accurate job.

Fig. 2. After valves have been ground the gauge is positioned as shown. It indicates exact shims to use for compensating material loss through grinding or valve wear.



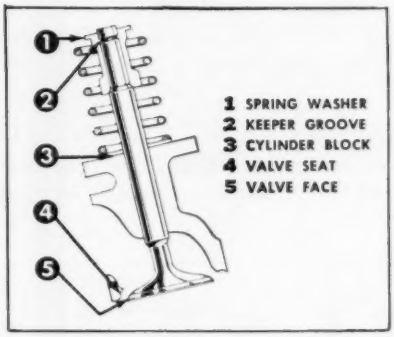


Fig. 3. The points of wear which cause resultant loss of valve spring tension.

HOW GAUGES WORK

Here's how the gauges work: After the cylinder head has been stripped and the valve has been ground, the correct gauge is placed on the valve, as shown in Fig. 2. The correct gauge setting and correct shims are easily determined by referring to the selector chart. Using the specified setting, *measure* to the top edge of the top groove in the valve stem. With the valve held snugly on the seat, and gauge held tight against the head, read the marking. The space between the top side of the keeper groove on the valve stem, and the correct marking on the gauge, indicates the shims needed to restore original tension. On models with double counterbore heads (inner spring seats lower than outer spring) determine the shims needed for the *outer spring*. Use the same shims on the *inner* spring, too. Shimming only the outer spring will result

in inefficient operation.

WHY REDUCED TENSION?

This brings up the second point. Why does grinding the valve reduce valve spring tension? Every grind-off in machining the seat and valve face (or wear at other points, Fig. 3) actually lengthens the valve stem. Every fraction removed allows the valve to seat deeper into the head, lengthens the valve spring height, with consequent reduction of tension. Obviously, it sounds rather unimportant to say that grind-off and/or total wear is only .035". But figure it out. Here's what it really means: Remove .035" of material and you lose approximately one-fifth of the spring tension. The cam opens the valve, but only the valve spring closes it. If the valve spring is weak, the valve will not close. And then what happens? The valve will not cool efficiently and soon it fails. Flutter, surge and bounce prevent smooth running—the preliminary to more trouble.

NOT A CURE-ALL

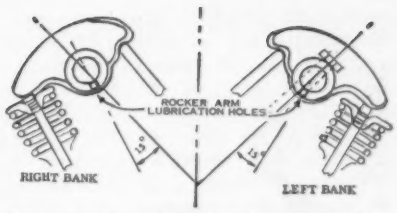
One more point remains to be observed. Always check valve springs according to factory recommendations and replace with new springs where needed. Bear in mind—valve spring shims are *never* a cure for *weak* valve springs.

Assembling Chrysler Rocker Arm Shafts

To insure installing rocker arm shafts correctly on 1959, '60 and '61 Chryslers and Imperials, the factory recommends the following procedure:

Install the rocker shafts so that the 3/16" diameter rocker arm lubrication holes point downward into the rocker arm so that the 15° angle of these holes points toward the valve end of the rocker arms (as shown in sketch).

The 15° angle of the rocker arm lubrication holes is determined from the center line of the bolt holes



through the shaft which are used to attach the shaft and bracket assembly to the cylinder head.

It is important that the rocker arm shafts be installed as outlined above, so as to prevent excessive oil spray and improper lubrication of the valve mechanism components.

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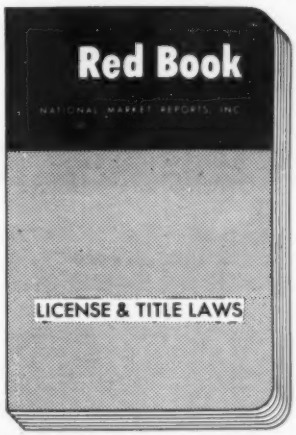

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By J. EDWARD SCHIPPER
Detroit Editor

Spokes from the "hub"

● ACCORDING TO THE Automobile Manufacturers Association, the calendar year of 1960 was second best in the history of the industry in spite of the minor depression. U. S. motor vehicle production for that year totaled 7,905,002 units, up 17.6 per cent from 1959. The year's output included 6,701,279 passenger cars, 1,199,567 trucks and 4,155 motor coaches. This compares with 1959 production of 6,723,588 units—5,599,492 cars, 1,121,404 trucks and 2,692 buses.

* * *

A long step toward greater standardization of traffic signs throughout the United States has just been taken. The Bureau of Public Roads has announced that only such devices as conform to the new Manual on Uniform Traffic Control Devices for Streets and Highways, will be approved for the Federal-aid highway systems. Pretty soon we will all know how to make a left turn in Squeedunk no matter where we come from.

* * *

From now on you can look for greatly increased use of high-impact plastic for automobile use. The Buick Special for 1961 has a dashboard instrument cluster of this material, wired with a printed circuit. This same type of construction has found a great deal of favor on GMC trucks and coaches for the last year. The cluster on the Buick Special is molded in three sections and then joined with self-tapping metal fasteners. It weighs only 2.3 lb., which is ⅛ as much as the traditional die-cast metal cluster. It is made in a basic color and then painted to match the car interior. It has withstood severe "shake" tests in a vibrating machine and has withstood 220° F. in a heat-resistance test.

* * *

Propane won out over Diesel in the five-month study made for the Chicago Transit Authority. In its report to the Authority, the consulting firm of Arthur D. Little, Inc., sums up its findings in the recommendation that Chicago Transit Authority should continue to purchase propane buses for the major part of its fleet requirements. The big difference between propane and Diesel models, according to the report, was maintenance cost. Report states that Diesel buses would have to improve their maintenance cost record by from 34 to 57 per cent in order to compete in this fleet operation.

* * *

Central Foundry Division of General Motors Corp. has shipped its 100,000th cast aluminum V-8 cylinder block and its 200,000th cast aluminum cylinder head for '61 General Motors automobiles. The aluminum blocks and heads are used in the Buick Special V-8 engine, the Oldsmobile F-85 V-8 and in the V-8 engine which is optional in the Pontiac Tempest. Current production at the Defiance (Ohio) plant of Central Foundry is more than 1,000 blocks and 2,000 heads per day. These casting are semi-permanent mold type.

* * *

There are a number of situations where exceptionally durable or special quality coatings are required over asphalt-concrete or portland-cement concrete pavements. New isopolyester resin-asphalt laminated overlays are said to meet the requirements for this type of work. This material has low-wear, high-skid resistance, solvent resistance and special anti-rumble qualities. Favorable early experience with these coatings indicates that their use may become widespread. These overlays are the subject of a study by California Research Corp.

* * *

Don't be surprised to hear that Cadillac has put out a compact model—that is, a compact by Cadillac standards. The new Town Sedan Model has identical interior dimensions with the Sedan de Ville model but is seven inches shorter at 215 in. Both models have the same 129.5 in. wheelbase, the seven inches being taken out of the rear deck and trunk. The new car made its bow at the General Motors Motorama in San Francisco, January 7-15.

* * *

In a year-end statement made by Harvey S. Firestone, Jr., Chairman, The Firestone Tire & Rubber Co., he stated that, "1961 should see a continued expansion of synthetic rubber use which currently represents some 70 per cent of total new rubber consumed in the United States. Several new synthetic 'naturals' will become more available in 1961, including the Firestone Diene and Coral rubbers. These will be produced at new facilities at Orange, Texas. World consumption of natural and synthetic rubber in 1960 reached some 3,785,000 tons, an increase of about 100,000 tons over the previous high of 1959. Current estimates indicate consumption at the rate of 3,950,000 tons in 1961."

* * *

Rochester Products Div., which makes carburetors for General Motors cars and trucks, has established a Value Engineering Department which will be under the direction of Theodore H. Redman and G. C. Porter, formerly of the division's product engineering department. These men will report to Russell F. Sanders, director of engineering and sales. Throughout the entire automotive industry during the year 1960, there has been a marked trend toward the appointment of Quality Engineers who are responsible directly to management. These engineers not only are checking accuracy in manufacture but also are evaluating their products as against performance in the field. This is an interesting and valuable trend which should bear beneficial results.

Optimistic reports for 1961 are coming not only from the vehicle divisions of the automotive industry, but also some of the allied activities. Merritt D. Hill, vice president and general manager of Ford Motor Company's Tractor and Implement Division states that "demand for farm equipment is on the upgrade and industry sales in 1961 should be 15 per cent higher than in 1960."

* * *

A two-ply tire is now under development by The Firestone Tire & Rubber Co. for possible use as original equipment on future compact cars. The new two-ply tire is lighter than the four-ply tire and offers somewhat softer riding qualities, according to J. J. Robson, director of tire engineering and development. While the tire is still in the experimental stage, both laboratory and road tests indicate the new tire's durability under rugged driving conditions. Several automobile manufacturers are reported as presently testing the new tire on their compact models.

* * *

For a long time it was thought that nothing would ever replace natural rubber for heavy-duty truck tires. However, there has been a new "breakthrough" in this field. United States Rubber Co. has begun production of truck tires with treads containing a blend of polybutadiene synthetic rubber and natural rubber. This is claimed to be the first commercial use of this material and the second step toward replacement of natural rubber in heavy-service tires made by U. S. Rubber. This company started production of truck tires with polyisoprene rubber, which is the man-made duplicate of tree-grown rubber, in March of last year. It is claimed that the new material runs from 15 to 20 degrees cooler and gives approximately ⅓ more mileage than truck tires with either all-natural-rubber or with the polyisoprene treads. The new tire is also claimed to eliminate groove-cracking as a problem in truck fleet operations.

* * *

According to Jack F. Wolfram, Oldsmobile general manager, the exact percentage of full-size 1961 Oldsmobiles equipped with Hydra-Matic since the beginning of production in early September, is 99.54. Wolfram states that this means that Olds customers are ordering the transmission option on 199 out of every 200 full-size Oldsmobiles built. Oldsmobile has a newly designed Hydra-Matic transmission this year with what they have called "Accel-A-Rotor action." It is 70 pounds lighter than the previous transmission, with a more extensive use of aluminum and 28 per cent fewer parts than the previous model.

* * *

The 1961 version of the Chrysler Imperial LeBaron made its initial appearance in dealer showrooms early in January. It differs from other Imperial models, particularly in the rear roof-line and the rear window opening. It is the first car to make a point of having a smaller amount of glass. The rear window is 802 sq. in., claimed to be the smallest of any standard size American production car. This contrasts with the Imperial Crown and Custom four door models which have a rear window area of 1,479 sq. in. C. E. Briggs, Chrysler vice president, states that the smaller window, "affords a feeling of privacy to rear seat passengers and it also brings a conservative touch to the overall appearance of the car."

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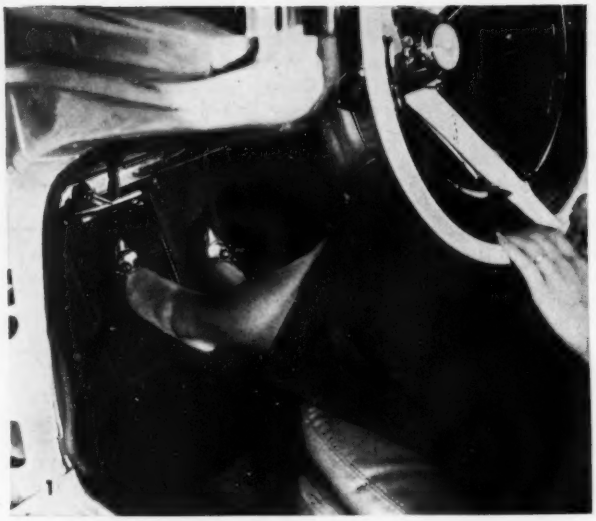
Recent developments for better braking, steering and car control



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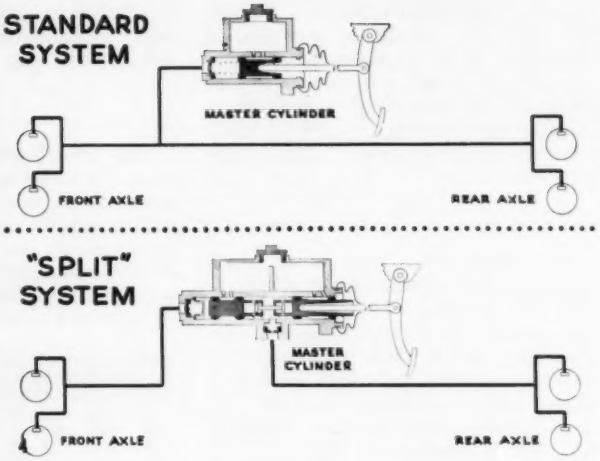
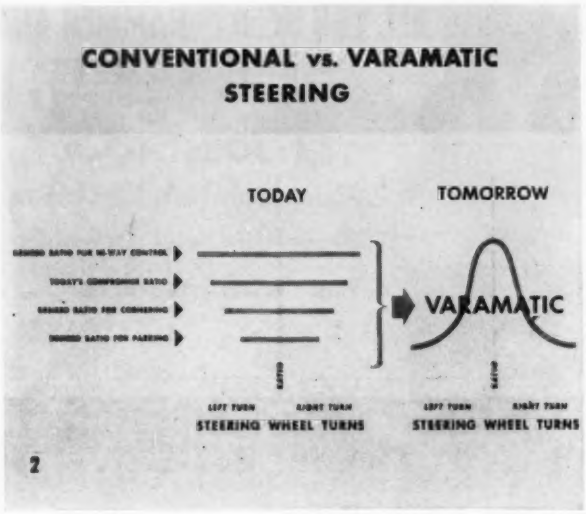


1—"Step Forward"—No accelerator or brake pedals needed in this Bendix offering. Starting and stopping functions of car are regulated by foot pressure to flush-mounted floorboard accelerator and brake controls.



2

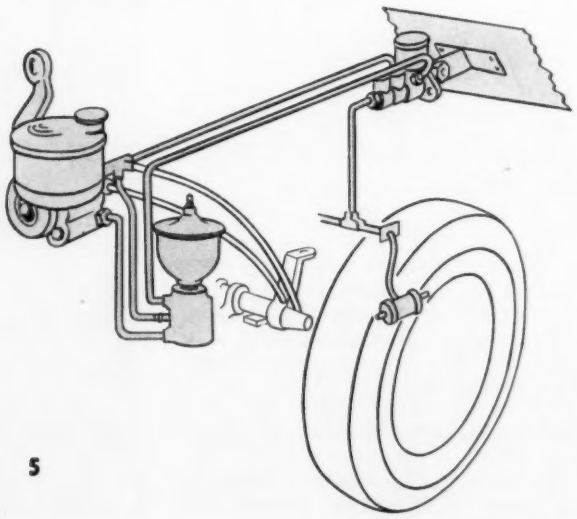
2—New steering—Varamatic steering by Bendix, has a variable ratio between steering-wheel turns and angle of car's front wheels. Said to reduce by 60% number of steering-wheel turns required for parking or maneuvering, at the same time providing firm, safe, steering during all driving.

3—New "Stop Power" for trucks—Bendix heavy-duty hydraulic brake unit (left) has met tests of country's toughest mountain grades, according to company engineers. Smaller unit, part of new emergency brake for "positive control regardless of failure in any part of system."

4—Safety Factor—These diagrams compare the design of a standard braking system with the Bendix "Split System" said to provide a greater safety factor because injury to the plumbing serving either front or rear wheels leaves other brakes unaffected.

5—Pedalless Brake System—Bendix full-power brake system for the pedalless car. Control valve is in the unit in front of floorboard. At left, unit with dual pumps, sources of fluid for power steering and the braking. Accumulator is urn-shaped unit which stores fluid under pressure. Underneath is regulator valve that determines pressure in accumulator.

3



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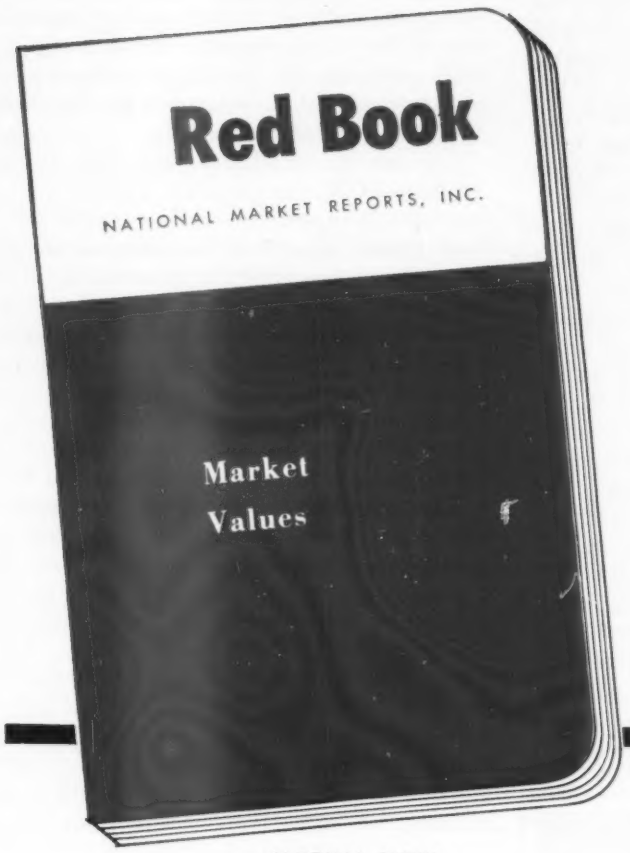

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Crankcase Vapors . . . *(Continued from page 26)*

valve chamber where it passes into a tube connected by means of a rubber hose to the air flow valve and then into the intake manifold. One of the illustrations shows this.

Due to the nature of the air flowing in the ventilating system the connecting tubes and air flow valve will be subject to fouling, states Studebaker. Therefore, at regular intervals of 10,000 miles or less, depending on operating conditions, the pipe and tube assembly and the air flow valve should be removed and thoroughly cleaned. Under cold weather driving conditions, more frequent cleaning of the tubes and valve assembly are necessary.

The air flow valve assembly is a check valve, spring-loaded against vacuum. Incorporated in the valve is a metered hole which allows approximately one (1) cubic foot of air per minute to circulate through the crankcase and valve chamber when the engine vacuum is highest. As the engine vacuum drops, air flow through the ventilating system gradually increases until at 3 to 7 inches of vacuum, the air flow is approximately 4 to 5 cu. ft. per minute.

To disassemble the air flow valve, separate the pieces of the housing and remove the valve and spring assembly. Clean the valve and valve seat with any good solvent cleaner, blow dry with compressed air and reassemble. Be sure the spring is snapped into the groove under the head of the valve. If the spring is not correctly assembled to the valve, the valve may cock on its seat, giving improper operation to the ventilating system. Place the spring and valve assembly in the larger valve body section, complete the assembly by screwing the smaller valve body into the larger one.

The positive crankcase ventilation system developed by AC in co-operation with motor car manufacturers incorporates a spring loaded valve. It has been tested extensively and is available for most types of cars and trucks on the road today. Distribution is through car builders, dealers, parts distributors, oil companies and independent retail outlets.

In addition to its economy and anti-sludge features, the system is said to consume unburned hydrocarbons in the crankcase. These hydrocarbons are a source of air pollution according to research studies made by the Automobile Manufacturers Association.

Reporting before the House Permanent Subcommittee on Health and Safety last year, the AMA pointed out that tests indicate crankcase blowby is a major source of unburned hydrocarbons now emitted by motor vehicles. Further tests have demonstrated that, in individual vehicles, from 20 to 70 per cent of total unburned hydrocarbon emissions, including both exhaust and crankcase, can be halted by application of a positive crankcase ventilation system.

The AC system consists of a crankcase ventilation valve plus tubing, clamps and adapters so the product can be fitted to any engine. The ventilation valve is designed so that the rate of flow through it varies with engine speed and throttle position. This is to assure smooth engine operation.

HOW TO CHECK SYSTEM

Checking positive crankcase ventilation systems is said to be quick and easy with the new test-device announced recently by AC Spark Plug Division of GM. The tester will work on all positive crankcase systems using AC-type valve—approved by the Automobile Manufacturers Association for "original equipment" installation on 1961 models, AC engineers report. To check the system you simply remove the breather or oil filler cap on the engine and replace it with a rubber adapter. Then connect a rubber tube to the adapter and to the base of the tester. Check to be sure all other atmospheric openings to the crankcase are sealed. Some V-8 engines have a breather opening on each cylinder bank, and the second opening should be

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sealed with a blank adapter included with the tester. Adjust the selector knob on the base of the tester according to the make, year and model of the vehicle being tested. Start the engine and hold the tester upright to observe the color indicator in the viewing windows. Green means satisfactory air flow through the valve; red means a reverse air flow, and yellow means no air flow, whatsoever.

RESULTS OF AIR FORCE STUDY

A comprehensive study of crankcase ventilation was recently completed by the 802nd Air Division of the U.S. Air Force at Schilling Air Force Base in Kansas. The program was undertaken primarily to evaluate existing equipment for accomplishing crankcase ventilation.

In the presentation of the Air Force report a number of facts relating to engine operation and crankcase ventilation came to light. Among them are:

The crankcase oil temperatures must be maintained between 160°F. and 180°F. to permit minimum sludge and varnish formation in an engine.

Do you want to buy a business?
Use our Classified Columns—Page 80

Excessive heat as well as cold is conducive to sludge formation.

There are no completely effective crankcase ventilating systems utilized on military vehicles which meet the criteria established up to this time.

There are no additives capable of neutralizing fuel and water dilution in engine oil.

Water injection will remove carbon deposits from the combustion chamber.

There are no full flow oil filters employed on present day engines that are truly full flow filters.

Crankcase oil capacities have become progessively less during the past decade.

Combustion chamber temperatures and pressures have increased steadily during the past decade.

There has been little change in the method of ventilating crankcases with increases in horsepower.

Valve overlap has increased with horsepower increases in high speed engines. As a matter of interest, the valve overlap on the new Buick aluminum engine is 62°.

Blowby from the combustion chamber increases with horsepower.

Many harmful corrosive by-products from the combustion chamber are included in blowby.

A definite relationship exists between cubic inches of displacement and blowby.

Horsepower decreases with increased combustion chamber deposition.

Fuel economy decreases with increased combustion chamber deposition.

Octane requirements of fuel increase with increases in combustion chamber deposits.

Pull-over (drawing of oil from the crankcase) occurs at high speeds with many road draft tube installations.

Crankcase ventilation is an important function since it affects every part of the engine.

It should be remembered that for every gallon of gasoline burned in a gasoline engine more than 1 gallon of water is formed, from the combustion of the hydrogen in the fuel and the oxygen in the air. This water is formed as a vapor but is subject to condensation whenever and wherever the temperature drops or is below the atmospheric boiling point of water (212°F.). Thus, there is a constant source of moisture every time an engine is operated.

As long as the water can be eliminated from the engine in vapor form it does little harm, but with cold engines there will be liquid water inside the engine until the engine becomes hot enough to vaporize the water and keep it in vapor form.

Improved Gasket Minimizes Leakage at Power Steering Reservoir Cover

An improved power steering reservoir cover gasket is available from the Lincoln-Mercury Division of Ford Motor Co. to minimize the possibility of oil leakage.

When replacing the gasket, it is recommended that it be fastened in position on the reservoir cover using gasket and sealed adhesive and then torquing the cover hold-down nut to 12-15 in. lb.

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These are new *manufacturers' products*

HOW TO GET RUSH INFORMATION

If you want further information or literature describing the products shown in our "These Are New" pages, just use the handy Business Reply Card you'll find further back in this issue. Whether you want information on one or more of the products, all that is necessary is to mail this Postage paid card properly filled out to AUTOMOTIVE SERVICE DIGEST. Our Reader's Service Dept. will contact the manufacturers directly and see that you obtain the requested information as quickly as possible.

Power Driven Regroover

A power driven, precision regrooving tool, said to make installation of top groove spacers a fast, easy job, is announced by the Hastings Manufacturing Co.

The machine regrooves pistons of 3" to 5" in diameter with the connecting rods on, according to the manufacturer. It requires little work bench space, and is powered by a ¼ hp, 110 AC electric motor.

Cutters are supplied to widen 5/64", 3/32", 1/8" and 5/32" grooves. An automatic depth gauge assures proper depth of cut on the piston.

(Circle No. 1 on Reader Service Card)

Foreign Car Engine Parts

A new line of engine parts for all popular foreign-made cars is now being marketed by the White Machine Works.

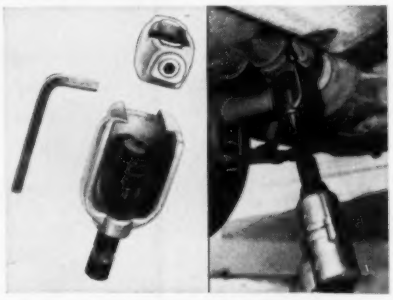
The new line is said to offer complete coverage of foreign car engine replacement parts, including pistons, rings, sleeves, pins, valves, guides, valve springs and engine bearings. To take care of immediate demands, these parts will be available on a nationwide basis in company warehouses located at Atlanta, Ga., Chicago, Ill., Dallas, Tex., Los Angeles, Calif., Miami, Fla., New York City, Portland, Ore. and Eau Claire, Wis.

A complete and separate foreign car engine parts catalog is available. Free copies are available on request.

(Circle No. 2 on Reader Service Card)

Pullzit U-Joint Service Tool

A new tool, called Pullzit, has been developed by the U-Joint Tool Co. to take the hard work out of U-joint servicing and increase lube rack profits. According to the manufacturer, the tool does the complete job of disassembly and assembly—eliminating the hammering, barked knuckles and damage to bearing and cross. What is most important, the manufacturer states that the toughest U-joint servicing job can be completed in 20 minutes.



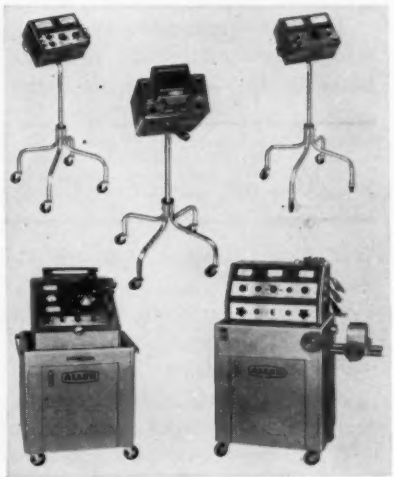
All a mechanic needs with the Pullzit is a ¾" wrench. Just turning the screw presses out the trunnion bearing cup from one side; then the special "floating wedge" Gator-Grip collet grips the projecting cup tightly and, as the screw is turned, pulls the cup from the yoke smoothly and easily. On reassembly, the tool pushes the cup in evenly and quickly, without damage to bearing.

(Circle No. 3 on Reader Service Card)

"Allen-Tronic" Line for '61

The Allen Electric and Equipment Company announces the 1961 "Allen-Tronic" line of automotive testing and servicing equipment. New products, new colors of red, gold and gray, and completely new features highlight this new line.

The "Allen-Tronic" line consists of: **Syncrograph** (Model E01416HD) featuring 8,000 rpm, A.C. operated, safety features and new color . . . **Generator-Alternator-Regulator Tester** (Model 20-09) for complete testing of all types of generators, alternators, standard, double and transistor regulators . . . **Volt-Amp Tester** (Model 27-37) featuring built-in field rheostat and "dial your test" selector . . . **Ignition Scope** (Model 10-09) with available portable stand, featuring "dial your test" selectors, two controls, three connections and only one basic hookup . . . **Battery-Starter Tester** (Model 16-30) with available portable stand, featuring latest design for complete testing of batteries, cranking motors, cables, switches and connections.

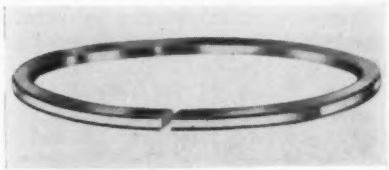


(Circle No. 4 on Reader Service Card)

Fight HEART DISEASE #1 ENEMY
Give HEART FUND ®

Moly Filled Compression Ring

A recent development of Ramco Engineering may soon obsolete many of today's compression rings. Recently completed test findings in friction re-



ducing benefits have been spectacular, according to the Ramsey Corporation.

Through a Ramco-developed process, the channeled face of a cast iron compression ring is filled with four to six thousandths of pure Molybdenum. The channeling leaves ten to twenty thousandths of cast iron at the top and bottom of the ring face. This, according to Ramsey, gives the ring the quick seating qualities of cast iron, plus the long wear characteristics of Molybdenum.

(Circle No. 5 on Reader Service Card)

Bipod Jacks

Hein-Werner announces an improved and modernized line of mechanical bipod jacks which feature improved safety, operating ease and overall lifting performance.

A totally new universal lifting hook not only self-aligns to older-style bumper contours, but offers the operator a choice of two load contact points in order to correctly lift all passenger cars, including 1961 models.

The front leg extension on these Hein-Werner Snappy Bipod Jacks encloses the lifting screw to keep dirt and moisture away from moving parts; also reduces strain on screw. Heavy-gauge steel legs are spread apart with a locking bar that keeps loads safely balanced. When not in use, jacks fold flat for convenient and compact storage. Each model is rated at 1½-ton capacity.

(Circle No. 6 on Reader Service Card)

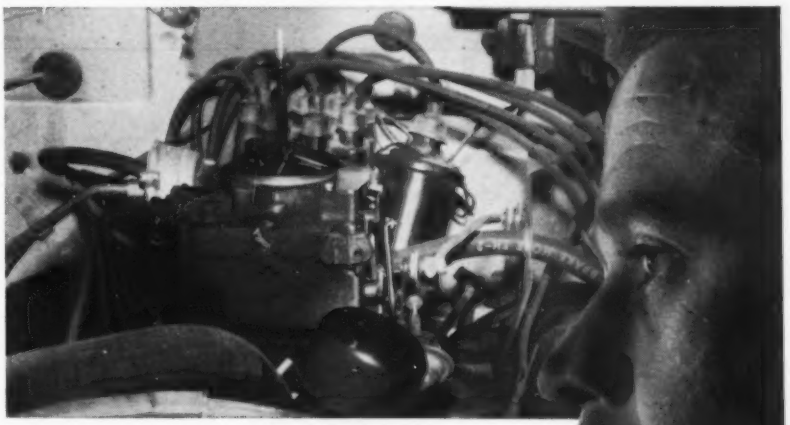
Full-Flow Oil Filters

The J. A. Baldwin Manufacturing Co. announces their new Vac-Cel Models V-1-F and V-2-A depth type full-flow oil filters. Guaranteed to filter oil visibly and chemically clean, the new filters feature cotton base material exploded in the elements at one stroke under 2,000 lb. pressure. This new process is said to prevent channeling and setting, yet assure positive high flow even under extreme cold conditions. The V-1-F fits all Ford family cars 1957 through 1961 and all Chrysler Corp. cars 1958 through 1961, with throw-away. The V-2-A fits all General Motors cars 1959 through 1961, with throw-away, except Corvair.

The filters feature a completely new base plate with the spin-on filters' first use of the premium quality rubber hydraulic "O" ring, which is said to work effectively on slightest pressure contact. The performance of the "O" ring improves as oil pressure increases . . . seated in a groove, perfect contact is guaranteed . . . no buckling or wrinkling can be caused by improper seating. In addition, a preci-

sion built anti-drain-back seal completely eliminates the oil from draining out of the filter when the engine is stopped.

(Circle No. 7 on Reader Service Card)



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These are new *manufacturers' products*

Tire Tread Gauge

A new "tread-used" gauge, designed especially for simplified customer reading, is announced by the Dill Manufacturing Co.

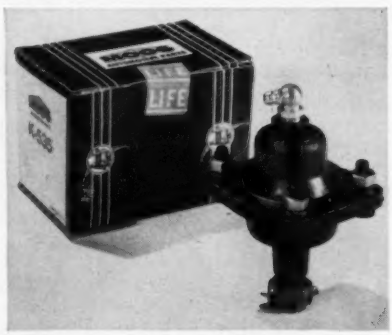
Calibrated by percentages, the simplified design of this gauge is said to be the result of numerous requests from dealers and tire servicemen for a gauge that would save time and unnecessary explaining to customers.

For use in measuring premium and 100 level passenger car tread, the gauge graduations are in 10's of percent for easy calculation of adjustment. The percentage indicators are based on normal 11/32 tread. There are no charts to read or interpret. The gauge percentage reads from 0% for a new tire to 100% for a bald tire.

(Circle No. 8 on Reader Service Card)

Adjustable Ball-Joints

In answer to the loose ball-joint problem permitting a custom adjustment, Moog Industries, Inc., announces three new adjustable ball-joints—the K-535 (lower ball-joints) for 1958-61 Pontiac, K-503 (lower ball-joint) for 1957-60 Cadillac and K-675 (lower ball-joint) for 1955-57 Chevrolet.



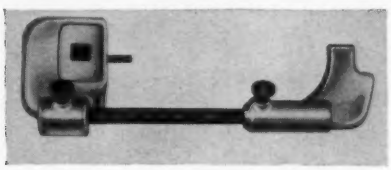
Patents have now been granted to the complete line of Moog adjustable ball-joints which are now available for most popular passenger cars.

(Circle No. 9 on Reader Service Card)

Brake Drum Mike

A precision brake drum micrometer with a universal range from 6½" to 18¼" that reads accurately, without fluctuation, is announced by Star Machine & Tool Co.

The new mike (Model 875) has a spring-loaded drum dial that *locks itself* for absolutely positive reading of maximum drum diameter with the first movement of the mike within the drum. All chance of operator error is thus said to be eliminated. Too, brake drums can be "miked" on or off the brake drum lathe with equal ease.



The mike can be used on all drums, including late models and drums with raised hubs, for checking out-of-roundness and also determining whether drums have been machined or worn beyond safety limits.

(Circle No. 10 on Reader Service Card)

Body and Frame Correction Machines

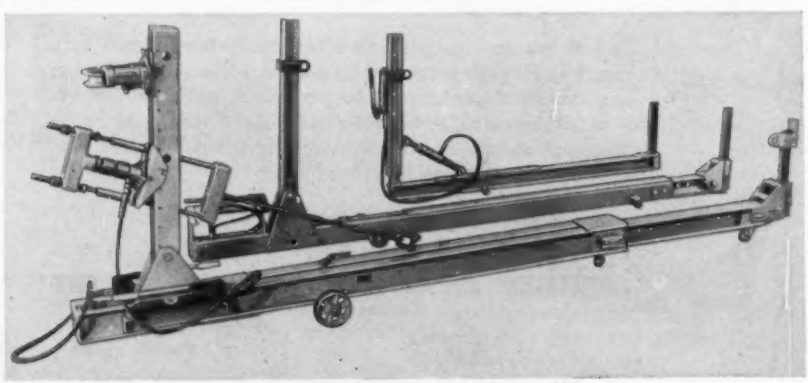
Three new Portable Bearcat body-frame and unitized correction machines have been announced by the Bear Manufacturing Co.

The power, size and design of the 120 Portable Bearcat is said to mark it as the most rugged and only portable capable of doing the complete job on any size conventional or unitized automobile.

An exclusive feature, the adjustable-height Pull-Yoke Assembly on the up-right beam, makes the 120 the only portable with these pull combinations: (1) continuous ten-inch pull at Pull-Yoke with assembly at any height and upright tower stationary; (2) double stretch-and-pull, decreasing or increasing pressure simultaneously or independently with tower upright; and (3) pulling with upright beam while independently controlling upper and lower pull with second and third jacks.

Another feature of the equipment is a sliding bar attachment on the main beam to make pulls from inside the engine compartment, conventional or rear-mounted, without removing the engine. For heavy pulls, the 120 provides pullrod metal-to-metal hook-ups instead of chains for greater safety and rigidity.

The 120 Bearcat is furnished complete with clamps, frame gauges, safety stands, rods, chains and attachments to do the complete job. The two smaller units shown in the illustration are designed primarily for sheet metal work.



(Circle No. 12 on Reader Service Card)

Liquid Skin Protector

Go-Jo Liquid Protective Skin-Coat is said to stop the penetration of paints, carbons, greases, gasoline, detergents, solvents, etc., with which automotive workers come in regular contact. According to the manufacturer, Gojer, Inc., it also facilitates the removal of stubborn stains, soils, and inks.

Its creamy liquid formula applies easily to any exposed skin area and dries rapidly to form an invisible barrier, and it will not come off on articles handled by the worker.

(Circle No. 11 on Reader Service Card)

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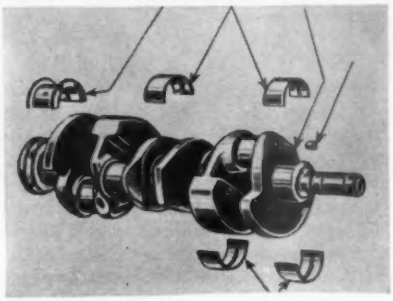
If it is, it will pay you to turn to page 64 of this issue for an important message.

Remanufactured Crankshaft Kits

In answer to widespread demand from the trade, Mustang Remanufactured Crankshaft Kits are now available to automotive service shops through warehouse distributors and jobbers who handle Mustang Replacement Engines. According to the manufacturer, all worn crankshafts are being accepted for trade-in regardless of condition, except when broken.



Accuracy, precision and close tolerances are assured under the highest engineering standards of quality control methods and techniques. The finished product is said to be as good or perhaps even better than the original equipment.

Each kit is complete with precision reground and polished crankshaft assembly along with new rod and main bearing inserts of the finest quality and yet prices are said to be considerably below that of new, original equipment.

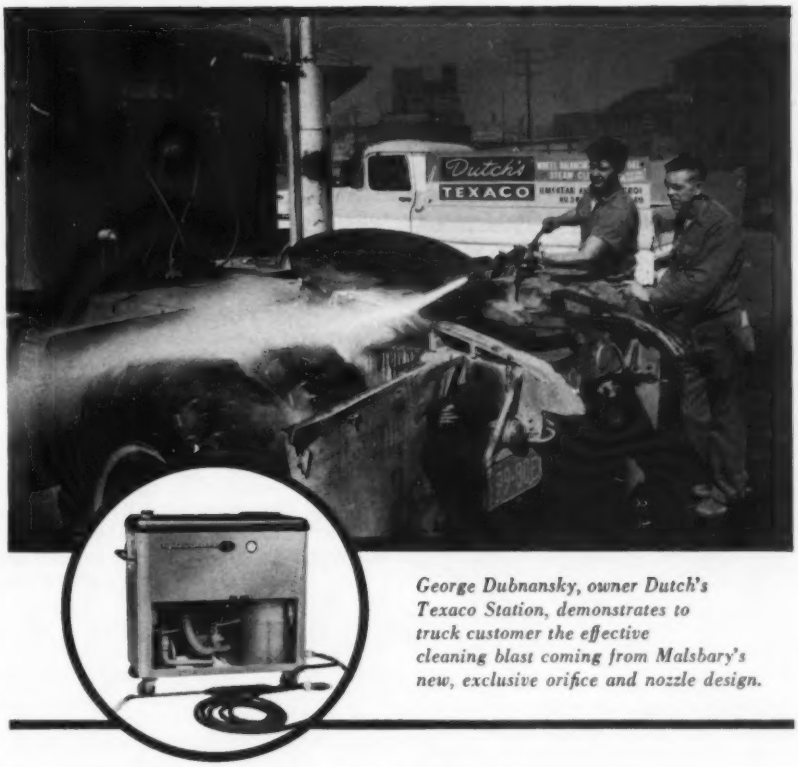
(Circle No. 13 on Reader Service Card)

Head and Block Refinisher

Van Norman's Model 570 Rotary Broach precision machines cylinder heads, engine blocks and other surfaces in a completely automatic, three-step operation. The operator sets up the work, adjusts the positive stock removal control, starts the machine and walks away. The machine shuts off automatically when the job is done.

Because of the rotary broach cutter action, blocks and other surfaces don't heat up; they can be machined in one pass. In addition, the machine resurfaces aluminum cylinder heads and the new aluminum blocks to correct vehicle manufacture specifications.

(Circle No. 14 on Reader Service Card)



George Dubnansky, owner Dutch's Texaco Station, demonstrates to truck customer the effective cleaning blast coming from Malsbary's new, exclusive orifice and nozzle design.

"Malsbary Model 130 Outperforms Any Steam Cleaner We've Ever Used"

Says "Dutch" Dubnansky: "We must have a reliable steam cleaner. We tried at least 5 other makes and none operated more than 30 days without numerous mechanical failures. Our Malsbary runs without any trouble."

Dubnansky cleans 90 or more trucks and used cars monthly at his Texaco station in Charleroi, Pa., gets big cleaner performance, at low cost, from his Malsbary 130. It delivers a full 130 gph of hot solution. Malsbary's exclusive new orifice and nozzle design produces a harder-hitting stream of larger droplets, in a more uniform cleaning pattern . . . gives performance superior to competitive 150-180 gph cleaners.

YOU CAN'T LOSE. Buy a Malsbary Model 130 and try it for 10 days. If it doesn't perform as stated in this ad, return it, and our dealer will refund your money. Call him now, or mail coupon.

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I would like ☐ literature describing Malsbary 130 cleaner; ☐ information on buy-and-try plan.

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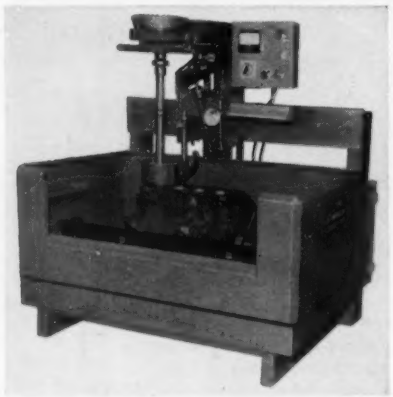
These are new *manufacturers' products*

Cylinder Resizing Machine

The "Cylinder King" Honing Machine, recently announced by Sunnen Products Co., is said to recondition cylinder blocks in half the time it



now takes by conventional methods.

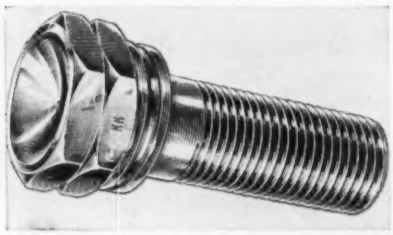
It handles all sixes and V-8's, including the late style angle head blocks, starting with the worn cylinders. The machine produces finished bores with one set-up including ring ridge removal. According to Sunnen, the new process guarantees factory specifications of accuracy, surface finish, and alignment on all types of cylinder blocks.

(Circle No. 15 on Reader Service Card)

Self-Locking Capscrew

A self-locking capscrew that is said to have greater tensile strength than conventional capscrews has been announced by Klincher Kapscrew, Inc.

Known as the Klincher Self-Locking Kapscrew, its configuration is that



of a conventional hex head capscrew with a double cap, a concave head; and a seating-type, all metal, reusable locking collar. When the stud is pulled down and the proper torque is applied, the collar compresses, causing the inside of the collar to move in and lock radially and axially on the stud shank and cap shoulder.

When the cap picks up all the load it can carry, the concave configuration of the cap permits it to adjust to the torsional load, equalizing the stresses and applying constant pressure through the elasticity in the cap design. More wrench torque can be applied before exceeding the elasticity of the stud . . . which is said to be more than three times that of conventional capscrews.

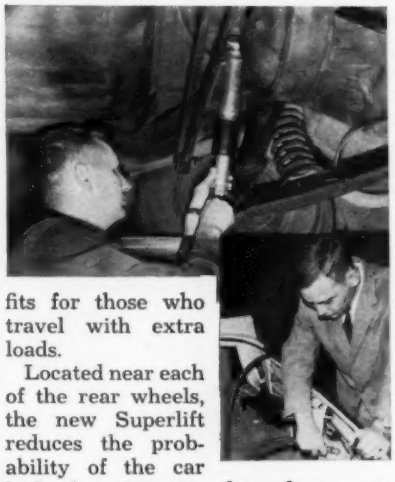
The capscrews are reusable indefinitely and are available in all standard sizes and to specifications. All standard threads are available.

(Circle No. 16 on Reader Service Card)

Superlift Suspension Adjuster

A new adjustable automotive suspension device, designed to maintain proper control of the car body under both unusual and normal loads, has been developed by Delco Products Division of General Motors Corp.

On most cars the Superlift is interchangeable with the Superide replacement shock absorber which Delco Products introduced recently. It is said to have all the advantages of the Superide plus additional riding bene-



fits for those who travel with extra loads.

Located near each of the rear wheels, the new Superlift reduces the probability of the car body dropping onto the axle, a common occurrence on rough roads when the car is loaded. According to the manufacturer, when loading the car with extras, Superlift gives support to the rear end of the body, keeping headlights safely aimed at the road. Also, the device reduces the likelihood of bumper drag when driving over steel ramps, and brings better handling and control of the car when pulling a trailer.

Heart of the Superlift is a rubber air chamber sealed to the outside of a Delco hydraulic shock absorber . . . the shock absorber operating independently of the air chamber. When carrying an extra load, drivers simply inflate the chambers, using service station air pumps to obtain the desired pressure. With lighter loads, drivers merely deflate the chambers.

Nylon tubes carry air to both Superlift units from a single filler conveniently located in the trunk, an automatic control of this nozzle keeps a minimum pressure in the units when they are being deflated. Operating pressure ranges from 10 to 65 psi in the chamber. Pressure in both units is constantly equalized for uniform control.

(Circle No. 17 on Reader Service Card)

Air Power Cleaning Gun

Gunk Laboratory's new three-phase power gun permits fast, effective, low-cost cleaning of motors and all types of fleet equipment with Gunk Super

Concentrate. It is said to differ from other air-operated cleaning guns in that it performs three separate functions—applies, rinses and dries.

Gunk's Power Gun performs best at between 100 and 150 p.s.i. and is practical for use with air compressors of 3 hp. or more. It is so designed to first apply the cleaning solvent with a powerful penetrating force to completely and easily saturate all greasy and grimy areas with the self-emulsifying solvent. This is said to permit thorough engine degreasing in a matter of minutes without harming painted surfaces or ignition systems.

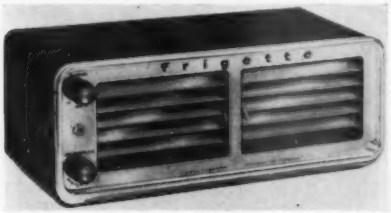
The second phase of the gun's operation consists of a powerful non-splash jet of water that completely washes away the emulsified grease and grime. Finally, the gun provides the application of controlled air pressure for quick drying of the cleaned surfaces.

(Circle No. 18 on Reader Service Card)

Looking for a Job? Use our Classified Columns—Page 80

Compact Air Conditioner

An automobile air conditioner small enough to fit the compact cars, yet said to be powerful enough to cool the largest model station wagon, is announced by the Frigiquip Corp.



Known as the Silver Dawn, the unit is only 3/16 in. high.

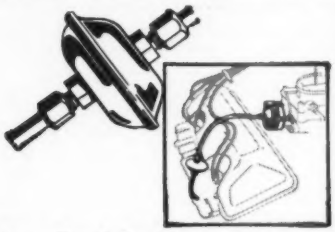
According to the manufacturer, styling makes the cabinet smaller, yet circulation of the cold air by new twin squirrel cage blowers makes better use of the surface area of the super-size evaporative coil, thus insuring proper circulation to every corner of the vehicle.

The unit combines a satin-finished, anodized aluminum face plate with a vinyl covering, laminated to a steel cabinet. Multi-adjustable louvers allow passengers to direct the flow of air exactly where wanted.

(Circle No. 19 on Reader Service Card)

Automatic Choke Air Filter

An automatic choke air filter that is said to screen-out carbon, dirt, gum and other particles from car and truck automatic choke mechanism is now



being offered by Houser Engineering & Mfg., Inc.

The filter unit is simply inserted in the automatic choke hot air line. One model fits all vehicles. Fine-mesh Monel metal screen filters out all foreign particles drawn into the choke housing through the hot air tube. Filter screen is easily cleaned with carburetor solvent and air pressure.

(Circle No. 20 on Reader Service Card)

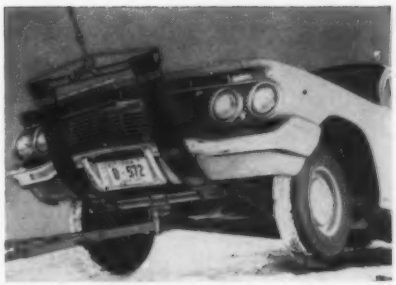
No-Mar Tow Bar

The new, improved, No-Mar Tow Bar, recently announced by E. R. Buske Mfg. Co., attaches quickly and securely to any tow truck, and tows all passenger cars—full-size and compacts.

The tow bar is said to completely eliminate chrome and paint damage. Any car can be hooked up in seconds, according to the manufacturer, and backed into close places at various angles with ease; there is no jamming into tow truck, swaying or shimmy.

The tow bar's sturdy tubular steel construction and rubber-coated, nylon-reinforced adjustable slings assure trouble-free operation. The unit features a telescoping shaft that keeps the upper sling assembly in perfect alignment with the vehicle being towed. The self-locking pins automatically lock the tow bar in towing position.

A 3-way swivel head allows vehicle in tow to swivel while being towed over ruts and curbs, keeping even tension on both chains and slings. It also



allows the lower bar of the sling assembly to rotate, aligning the hooks to the chains.

(Circle No. 21 on Reader Service Card)

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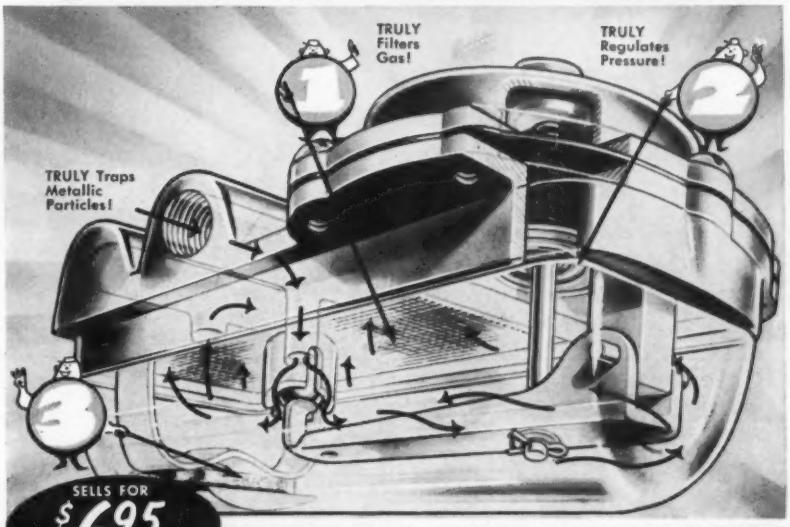

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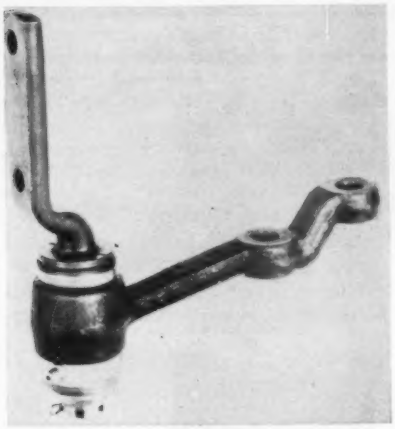
Idler Arm Ball Bearing Kit

O.E.M. Products Co. announces a steering idler arm ball bearing kit for 1960 Falcon and Comet cars. The kits,



precision-manufactured to exacting specifications for accuracy and dependability, contain thrust bearings, nylon bushing, steel collar and all other necessary small parts.

(Circle No. 22 on Reader Service Card)

New Transmission Bearing Seal

The Seal-O-Matic transmission bearing seal available from Better Part Specialties, is designed as a replacement part to permanently eliminate driveshaft "clunk", "snap", or "whip", while at the same time providing better protection against transmission oil leakage.

Torque control, fluid seal, alignment of moving parts and the weight of the front half of the driveshaft are all dependent on one lead babbit bushing at the rear end of the transmission. The manufacturer claims this area is the source of major trouble and should be "beefed-up." By replacing the oil seal in the rear end of the transmission with a Seal-O-Matic, a combination bearing and seal, the manufacturer states that the needed support is provided.

The seal is an "easy-to-install" precision bearing designed to completely support and hold the shaft in perfect alignment. Employing the principle of a diesel wrist pin, this bearing is made of bronze-fused-to-steel and machined to tolerances of .001". It provides a smooth, wear resistant surface and has a built-in, self-aligning neoprene oil seal for positive protection against transmission fluid leakage.

(Circle No. 23 on Reader Service Card)

IS YOUR ADDRESS LABEL PINK?

If it is, it will pay you to turn to page 64 of this issue for an important message.

Locking Gas Cap

Pictured is the new G-90 Dual-Loc locking gas cap being offered by the Stant Manufacturing Co., Inc. The G-90 replaces the old G-50 and G-70, thereby reducing inventory for customers . . . retains their proven features: extra heavy, rust-proofed steel locking members, turn-on type, positive in action, husky in appearance.

The G-90 has heavy, chromium plated outer shell; sturdy, high-pressure diecast internal body and is equipped with efficient swivel-type keyhole cover to keep out dirt and water.

(Circle No. 24 on Reader Service Card)

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Moving carriage with adjustable gibs provides for mounting drum close to bearing support — greater accuracy.

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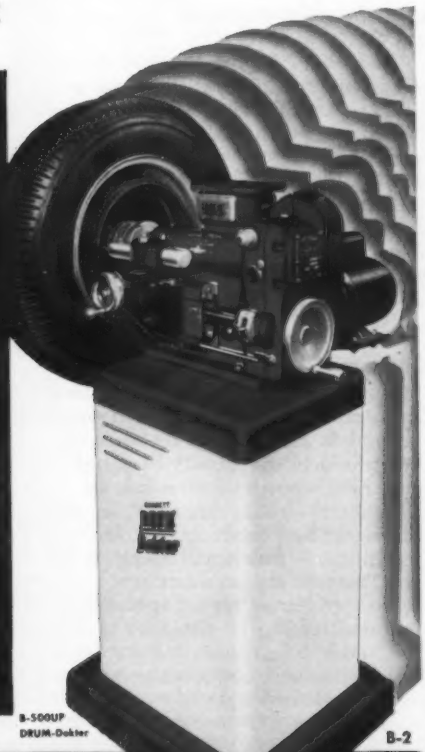

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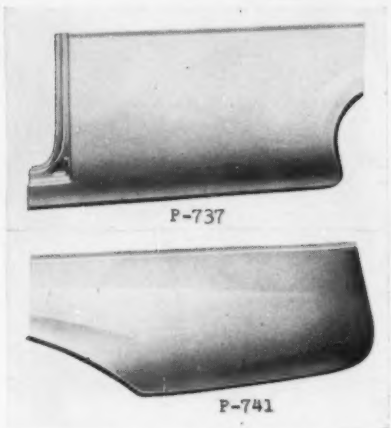
These are new *manufacturers' products*

Rear Fender Replacement Panels

Exact duplicates in shape and contour of the 1957 and '58 Ford custom rear fender sections they replace are these two new Sco-Pan panels now



available from Schofield Manufacturing Co.

Panel P-737 (top) is an exact replica of the lower front section of the rear fender. Panel P-741 (bottom) replaces the lower rear section of the rear fender. Both are available in right and left hand styles.

Literature available describes more than 600 other replacement panels designed to turn difficult, time-consuming repair jobs into easy, fast panel replacement.

(Circle No. 25 on Reader Service Card)

Chrysler Car-Chemical Line

Chrysler Corporation's Cycleweld Chemical Products Division announces a complete new line of chemical car-care products specifically designed to serve retail consumer after-market requirements. Initial introduction will feature six new products, the first of a large number which will make up the line. The first six products are:

Chrysler Moto-Prep: A specially refined and treated oil designed to provide better lubrication, reduce spark plug fouling, oil consumption, engine wear, and carbon build-up. It is a lubricant designed to extend the life of hydraulic valve lifters, valves and rings.

Chrysler Top Tonic: A gasoline additive designed to provide upper cylinder lubrication, reduce spark plug fouling, and carbon build-up. Top Tonic also prevents valve sticking and reduces pre-ignition knock.

Chrysler Start-N-Go: A highly refined and treated lubricating oil for use in two and four cycle engines to provide easier and faster starting and reduce carbon build-up and engine wear.

Chrysler Keen Site: An all-weather, year-round windshield washer solvent specifically designed to remove bugs and road grime from the windshield.

Chrysler Pry: Specifically designed for use in freeing manifold heat control valves; also for use as a heavy-duty, penetrating oil.

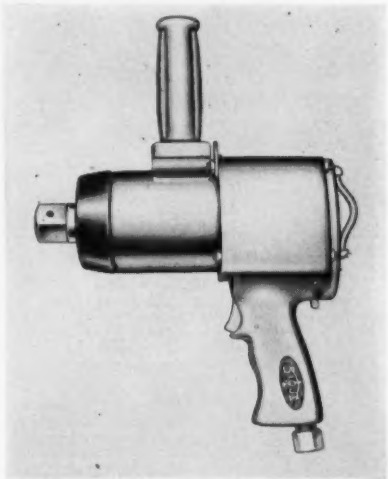
Chrysler Brake Fluid: A high temperature heavy-duty, non-corrosive, non-evaporating brake fluid with an operating range of 400°F. to minus (−) 60°F. conforming to or exceeding all SAE and Federal specifications. It is used as original equipment on all car and truck assembly operation at Chrysler Corp. plants.

The new chemicals will be marketed under the Chrysler name and manufacturers representatives will be appointed to handle distribution in all fifty states.

(Circle No. 26 on Reader Service Card)

Heavy-Duty Impact Wrench

Albertson & Company, Inc., announces a new Sioux heavy-duty, 1" square drive air impact wrench. A completely new and improved air



motor and housing is coupled with an impact mechanism of advanced design.

Air entry is through a ½" inlet, with streamlined housing assuring free air flow with minimum restriction. With more air moving at higher speeds the wrench is said to accelerate rapidly for faster rundown . . . work is completed more quickly . . . net time and air consumption per job is low.

The reversing valve with related volume control for right hand operation is leakproof and well protected. Bails provide for horizontal or vertical suspension. An auxiliary, adjustable handle can be moved to four positions.

(Circle No. 27 on Reader Service Card)

Welding and Cutting Outfit

A complete medium-sized full capacity gas welding and cutting outfit, available in a rugged tool box as the Marquette Redi-Pac, has been an-

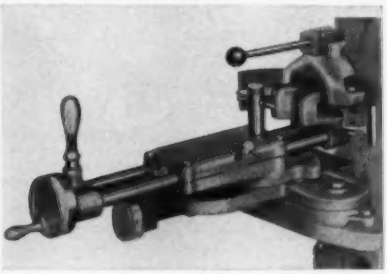
nounced by Marquette Manufacturing Co.

The outfit includes full-size heavy-duty gas regulators, full 25 ft. double line hose, 4 of the "most useful" welding tips, one medium-size cutting tip and all accessories. A full range of welding, heating and special purpose tips is available to fit the Star-Jet torch handle. In addition, a broad range of cutting tips is also available to fit the cutting assembly.

(Circle No. 28 on Reader Service Card)

Speed Lever Shoe Clamp

Barrett Equipment Co. announces a new 92-015 Speed Lever Shoe Clamp to convert earlier model B-75 series brake shoe grinders having screw



type clamps to the latest model.

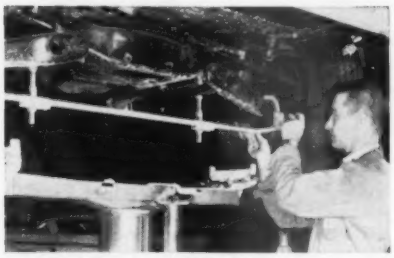
The new speed lever clamp is designed to reduce the time required to precision fit brake shoes to the drum and speed up brake service operations. It handles popular domestic and compact car brake shoes without special adapters.

(Circle No. 29 on Reader Service Card)

Torsion Suspension Gauge

A universal torsion suspension gauge, adjustable in all directions and designed to handle all present torsion systems, is announced by the Weaver Manufacturing Division of Dura Corp.

The new WJ-94 Gauge accommo-



dates all Chrysler-made products (including Valiant), as well as Chevrolet and GMC trucks equipped with independent front suspension and torsion springing.

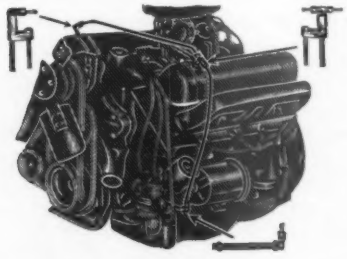
While best used with a twin-post lift equipped with combination wheel and service stands, the gauge can also be used with roll-on lifts, wheel-alignment outfits, or even on a level floor.

Inasmuch as spring-height readings must be taken with vehicle weight on the front wheels, the operator merely elevates the vehicle, places wheel stands under front tires, attaches the gauge and adjusts torsion bar until both gauge-scales read within ⅛ in. of one another and within ⅛ in. of factory specifications.

(Circle No. 30 on Reader Service Card)

Auxiliary Rocker Arm Oil Line

External auxiliary rocker arm oil lines, designed to by-pass clogged original lines in Ford and Chevrolet OHV engines to restore proper lub-



rication to dry, noisy rocker arms and push rods, are announced by Champ-Items, Inc.

The units (No. 201 for 8 cyl. Ford cars and trucks and 1954-'61 Mercurys, and No. 202 for 6-cyl., 1953-'61 Chevrolets) can be installed in less than an hour, according to the manufacturer, using normal hand tools and a drill. Only the valve cover need be removed.

Each unit consists of an oil-pipe replacement fitting that supplies oil flow through a copper line to a new hollow-core valve cover stud. Oil flows through this hollow stud to the original rocker arm shaft channel. Surplus oil is carried off through a port drilled in the end rocker arm shaft support.

These units are said to provide the same flow of oil and overflow drainage as the original system, yet save several hours usually required to reopen original lubricating lines.

(Circle No. 31 on Reader Service Card)

Ignition Kits

An ignition kit containing original equipment condenser and contact set for imported car applications has been released by Robert Bosch Corp. The kits are available in nine assortments to meet the specifications of Volkswagen, Mercedes-Benz, Porsche, Opel, Volvo, Saab, Borgward and Ford Taunus.

The kits are packaged in polyethylene bags for counter rack display, with the units individually boxed before packaging. Each kit specifically indicates car make and model and recommended point gap setting. A counter display rack, measuring 15 in. wide by twenty in. high including header card, is offered free with each 25 kits.

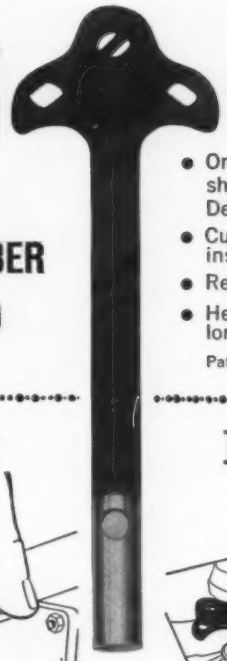
(Circle No. 32 on Reader Service Card)

NEW

Universal

SHOCK ABSORBER

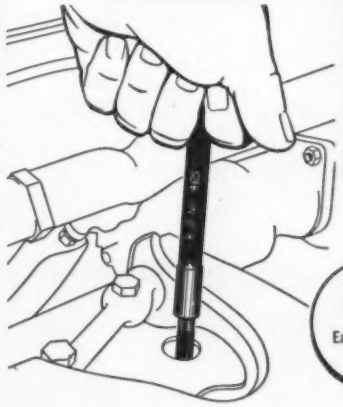
TOOL by K-D



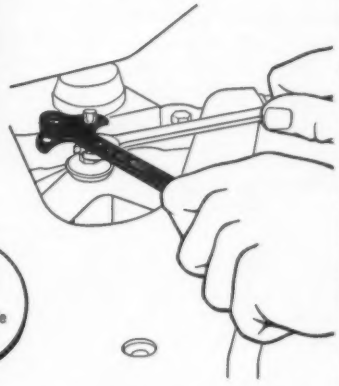
- Only tool which handles all shocks on all cars—including Delco
- Cuts valuable minutes from installation time
- Reaches where others can't
- Heat treated for rugged use, long service

Patent applied for

PULLS



HOLDS



#465

$1.75

Eastern resale Higher in West

This shock absorber tool reaches down through mounting hole, screws onto stud end, pulls it up into place for easy mounting.

A wrench opening for each shock type (including Delco) keeps stud stationary and eliminates twisting while mounting nut is tightened.

Ask your tool supplier for this new time-saver. It makes shock work so easy you can't afford to turn away the profit.

K-D TOOLS Make Hard Jobs Easy

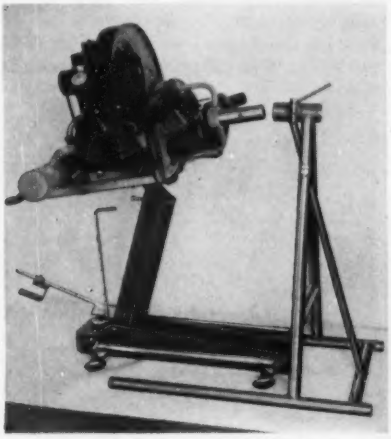
K-D MANUFACTURING COMPANY

Lancaster, Pa.

These are new *manufacturers' products*

Engine-Transmission Stand

Efficient, fast handling of the Volkswagen engine and transmission is made possible by use of the new Volkswagen stand and Model 700VW



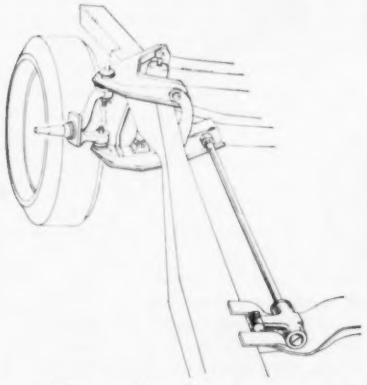
hydraulic jack being offered by the Edmund J. Wudel Mfg. Co.

Once the standard Volkswagen adapter is bolted on to the engine, it can be easily moved, by one man, from the hydraulic jack to the new Volkswagen stand, which can be used as a portable unit, or bolted to the floor.

(Circle No. 33 on Reader Service Card)

Moog Adds Torsion Bars

Moog Industries, Inc., announces a new addition to their under-car parts line—torsion bars for all Chrysler



cars. The torsion bar is pre-set for right and left hand applications, and made from the finest rolled alloy steel for maximum strength and stress resistance.

(Circle No. 34 on Reader Service Card)

Super Soft Spray Nozzle

Better, more economical application of the new automotive finishes is said to be achieved through the use of new DeVilbiss Super Soft spray nozzle. The nozzle, according to the manufacturer, was developed specifically for the new acrylic, enamel and lacquer finishes which came into wide use on the 1960 model cars and have been continued this year.

According to The DeVilbiss Co., automotive refinishers will find that the new cap (No. 154) will provide wide, wetter spray patterns, better atomization and easier lapping, less rebound and therefore less overspray . . . factors which will result in economy of both time and material.

(Circle No. 35 on Reader Service Card)

Oil Pressure Switches

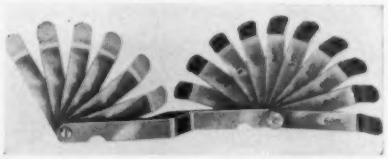
A new line of oil pressure switches, recently announced by Standard Motor Products, are said to be calibrated in three different pressure ranges in order to provide "custom-made" fit for each application.

Standard claims that its replacement switches will provide the car owner with the same protection against low oil pressure as the original units. To insure this claim, the company tests every switch for correct calibration and high-pressure leaks.

(Circle No. 36 on Reader Service Card)

Overhead Valve Gauge Set

Proto Tool Co. announces a new universal overhead valve gauge set



(No. 000R) containing 16 bent feeler gauges from .009" to .027". Each blade is offset at the right angle to protect mechanic's hands from hot manifolds while setting overhead valves on all late model cars. Each blade may be tightened securely in working position. The sizes are etched in each tempered steel blade.

(Circle No. 37 on Reader Service Card)

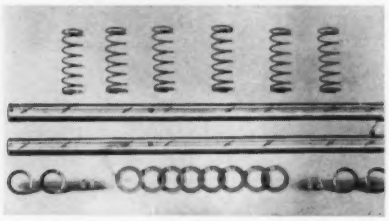
Charger Has Polarity Protector

Marquette Manufacturing Co. announces that it is now offering a special "thinking eye" polarity protector built into their Model 322NS battery charger to prevent the reverse flow of current—and corresponding damage to wiring harness and diodes—when servicing batteries in cars or trucks equipped with alternator systems. Also available is an attachment (Model 328) that can be mounted easily on any battery charger.

(Circle No. 38 on Reader Service Card)

Rocker Arm Shaft Kits

Improved "Bulldog" brand rocker arm shafts, especially hardened for longer life and packaged in complete kit sets, are now being manufactured by the Jambor Tool and Stamping Co.

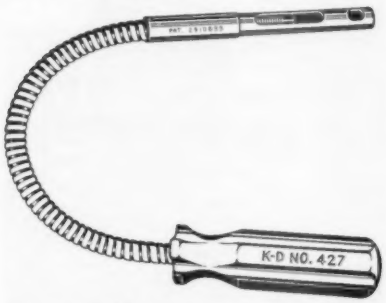


According to the manufacturer, these kits will cover 90% of all popular makes and models of engines, with each kit containing all necessary parts, as required, such as plugs, springs, washers, studs and bolts to go with the shafts.

(Circle No. 39 on Reader Service Card)

Hose Clamp Tool

A flexible shaft hose clamp tool is now offered by K-D Tools, which is said to make these jobs easier than ever. No kink, "memory" cable reach-



es into tight places, inaccessible to pliers-type tools. Easy turns of handle operate a screw within the sleeve on end of flexible cable, compressing the clamp. All sizes of clamps are securely held for removal or replacement. Overall length of tool is 14⅜".

(Circle No. 40 on Reader Service Card)

New Casite Additive

A new crankcase additive called Motor Honey, developed from a German formula for a 100% petroleum additive, is announced by the Casite Division of the Hastings Mfg. Co.

Motor Honey is said to increase the viscosity index and film strength of oil, and, according to the manufacturer, stop oil pumping, increase oil pressure and quiet noisy engines. It also is said to reduce crankcase dilution by checking blow-by.

The additive blends with any motor oil, including the so-called heavy-duty, high-detergent, premium or multi-viscosity oils.

(Circle No. 41 on Reader Service Card)

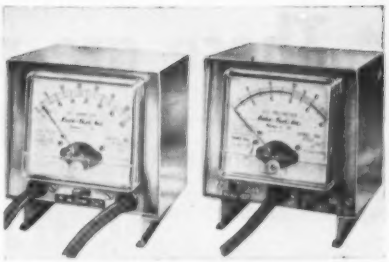
New Test Equipment Line

A new compact, light-weight D.C. Ammeter and a matching D.C. Voltmeter, featuring increased accuracy, simplicity and ease of use are announced by Auto-Test, Inc. These are the first of a complete new line of quality-engineered, moderately priced automotive testing instruments called the "Starflash" group.

The new instruments are attractively styled, each in a modern-design metal case measuring 4½" x 3½" x 5" high, finished in easy-to-clean chrome plate. Their large, easy-to-read meter dials are covered with formed transparent plastic that resists oil, grease and gasoline. Meters are jeweled movement, permanent-magnet D'Arsonval type, guaranteed not to exceed 2% error over full scale, equipped with external zero adjustment.

A ¼-ohm fixed resistor is provided on the Model A-102 "Starflash" Ammeter to test generator-regulator and the new generator-alternator systems and can be switched in or out of the circuit as needed. Copper clips and doubled, heavy-duty leads minimize voltage drop. Complete current coverage is provided, from minus 6 to zero to plus 60 amperes on both 6- and 12-volt systems.

Two separate voltage ranges are provided on the Model V-202 voltmeter, from 0 to 10 in 0.1 volt divisions, and 0 to 20 in 0.2 volt divisions; ¾-ohm and 1½-ohm resistors are provided in the tester and can be switched into the test circuit as needed. The ¾-ohm resistor can only be switched into 6-volt test circuits when the range switch is in the 10-



volt position. Likewise, the 1½-ohm resistor can be switched into the circuit when the range switch is in the 20-volt position—preventing overloads and burnout of the load resistors.

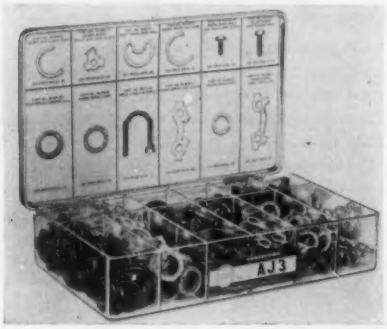
(Circle No. 42 on Reader Service Card)

EIS
BRAKE PARTS
says the customer...
pencils start to write
When you consider the vital job brakes must do — the brake parts you use for replacement become mighty important. They must combine the seasoning of experience with advanced engineering and their performance must leave nothing to chance.
These qualities are characteristic of EIS — The Brake Parts Line. Now, add informative packaging, quick-reference catalogs and wall charts, point-of-sale merchandising cabinets plus immediate availability from 39 strategically located warehouses. The result is a profit-producing Line that gets top position on most every order form.
COMING YOUR WAY IN FEBRUARY! THIS NEW, CONDENSED, HYDRAULIC, POWER BRAKE AND CABLE CATALOG will be mailed to every Repair Shop, Service Station, Garage and Car Dealer in the country! WATCH FOR IT!
BOOTHS 2554-5, 2619-20 at the IASI Show in Los Angeles
EIS AUTOMOTIVE CORP. • Middletown, Conn.

These are new *manufacturers' products*

Universal Joint Kit

The Perfection Gear Co. announces a new Universal Joint Small Parts



Kit (No. AJ-3). The kit is packed in attractive plastic box and contains over 550 replacement parts to repack 75 universal joints.

(Circle No. 43 on Reader Service Card)

Fuel Pump Tester

A complete fuel pump tester in one easy-to-use hand-held instrument is announced by Kal-Equip Company. According to the manufacturer, for the first time a flow meter has been built into a fuel pump tester giving instant reading in pints-per-minute without the use of a stop watch and measuring can.

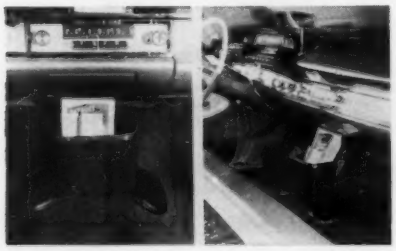
The chrome-plated instrument is connected into the gas line by means of a rubber hose and the engine is started. Pump pressure is read directly from the dial . . . press a button and a fuel capacity reading is instantly given.

Another feature of the unit is that it also reads engine vacuum, helping to find the cause of many engine complaints.

(Circle No. 44 on Reader Service Card)

Litter Basket

A Universal Litter Basket is now offered by MoPar Parts and Accessories Division of Chrysler Motors Corp., which is designed to help keep the car interior and highways clean as well as provide an ideal storage space for items such as road maps, sun glasses, flashlight, smoker's articles, etc. It is completely waterproof, stainless and made of durable plastic.



It can be placed in any position that is most convenient for driver and passengers. Because of its heavily-weighted flexible non-skid base, it is said to cling to the floor or seat and stay in place during normal driving. This feature eliminates the need for hooks, snaps or clamps to keep it in place.

(Circle No. 45 on Reader Service Card)

Oil and Amp Gauge Set

Many car owners are against depending solely for protection on a red light warning system . . . a sudden drop in oil pressure should be noted

immediately if costly engine repairs are to be avoided . . . and engines loaded down with extra accessories necessitate continual checking of actual ammeter readings in order to prolong the life of the car's battery.

To overcome this objection, Eelco Mfg. & Supply Co. is now offering a 100 lb. oil gauge—mounted in a chrome panel—for installation on any automotive engine, and a 120-amp. gauge adaptable to either 6- or 12-volt systems. The twin pack kit is also ideally suited to installation on marine or industrial engines.

(Circle No. 46 on Reader Service Card)

Front-End Replacement Parts

As a supplement to its line of wheel aligning and balancing equipment, Hunter Engineering Co. is now offering a line of front-end replacement parts.

Included are ball joint stabilizers to fit late-model Buicks, Cadillacs, Chevrolets and Pontiacs; ball joint service kits for tightening loose ball joints; idler arm silencer kits; idler arm replacement kits and "Quickee" hyster blocks for leveling sagging coil springs.

These kits are available individually as well as in two handy-size assortments packed in colorful, sturdy metal, merchandising display box. A handy application chart, showing the correct year-model car and replacement kit required, is mounted on the end panel of the display box for easy reference.

(Circle No. 47 on Reader Service Card)

Non-Corrosive Penetrating Oil

A new corrosion control product which combines penetrating oil functions with protective lubrication is announced by Dubay, Incorporated.

To be known as Dubay DICO Penetrating Oil, it is said to have strong penetrating powers which result from a joint physical-chemical action. The product is non-corrosive, absorbs oxides and has a very low surface tension. Unlike penetrants that use an acid or alkaline base, it leaves a thin, protective film over the base metal to prevent further corrosion or rusting. The film is light and oily, with no sediment or residue remaining to re-rust treated parts. The product is said to be safe for use on all metals.

Due to a relatively high flashpoint (140°F.), DICO is safe to use in confined areas. It contains non-aromatic synthetic hydrocarbons that are low in toxicity. The odor is non-toxic (slightly orange-like) which, according to the manufacturer, makes the product pleasant to use. It is non-injurious to hands, and remains viscous to −40°F.

(Circle No. 48 on Reader Service Card)

IS YOUR ADDRESS LABEL PINK?

If it is, it will pay you to turn to page 64 of this issue for an important message.

Accurate, factual parts and labor prices on leading

IMPORT CARS

Continuously Maintained Up-to-Date MASTER MANUAL on Popular Selling American Import Cars

NATIONAL'S Manual contains Labor hours with hourly rate conversion table—Parts list prices—Illustrations and exploded views. Provides a basis for accurate estimating and billing automotive repairs by:

1. Supplying current, authentic labor charges and parts list prices.
2. Eliminates guesswork. Calls attention to items that might be overlooked.
3. Lists operations in logical sequence for quick accurate estimating.

Complete one year service including up-to-the-minute price revision service and heavy duty ring binder, $15.50. Cash orders sent postpaid. C.O.D.'s plus charges or handled on a bill later basis to established businesses.

NATIONAL MARKET REPORTS, Inc.
900 South Wabash Avenue • Chicago 5, Illinois

Literature:

manuals, catalogs and charts

most items are yours for the asking

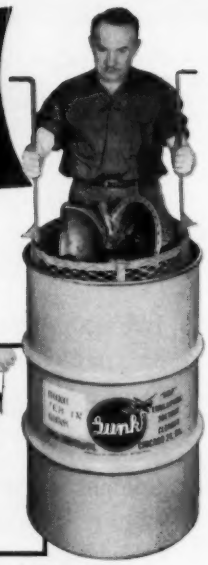
AUTO GLASS PARTS . . . The Shatterproof Glass Corp. catalog for 1961 lists complete glass specifications for all American cars, trucks and busses as well as glass for foreign vehicles. In addition, the catalog features an interchangeable parts section which lists makes and models of all automobiles, using each NAGS pattern number. Also includes a Safety Glass Area Chart along with a brief description of automobile glazing materials, laminated safety plate, laminated safety sheet and tempered glass.

(Circle No. 49 on Reader Service Card)

OIL, AIR FILTER WALL CHART . . . being offered by Hastings Mfg. Co. provides a convenient, ready reference for lube rooms. Gives up-to-the-minute specifications and cross-reference information on all leading filter manufacturers' 1961 oil and air filters for popular domestic and foreign cars.

(Circle No. 50 on Reader Service Card)

GUNK® Hydro-Seal
chemically destroys carbon binder -- cleans metal -- strips paint!



Hydro-Seal's powerful *self-scouring* penetrating action gets *inside* to completely remove grease, grime, oil, carbon, varnish, or paint. Just dunk; rinse with water. Eliminates costly, time-consuming scrubbing and brushing. Cleans *clean* — fast! Available in:

* 1½, 3, or 6-gallon CARBURETOR BENCH KITS with or without baskets, plus gallon cans for on-the-spot kit replenishment.
* 5, 15, 30, or 55-gallon Open-Head Drums with or without heavy-duty baskets for easier handling of AUTOMATIC TRANSMISSION AND ENGINE PARTS; replenishable floating-seal makes compound last longer.

You won't be satisfied using anything but *original, genuine* GUNK Hydro-Seal . . . see your jobber, or ask for full information.

"Dunk 'em in GUNK!"

Gunk

GUNK CHICAGO CO., River Forest, Illinois
serving the Midwest and Southwest

RADIATOR SPECIALTY CO., Charlotte, No. Carolina
serving the East, Southeast and far West

STEERING, SUSPENSION PARTS . . . 18 page wall chart catalog offered by Moog Industries, Inc., is said to be an excellent tool for showing the car owner where the trouble area is on the car and what parts need to be replaced. It contains complete line of steering and suspension parts, featured in large exploded illustrations complete with part numbers for easy reference.

(Circle No. 51 on Reader Service Card)

SEAT BELTS SAVE LIVES . . . is the title of an 8-page illustrated booklet, published by the National Safety Council, giving factual data on how seat belts lessen injuries and reduce the possibility of death in auto accidents. Research statistics in the brochure show injuries are prevented or lessened even if an accident occurs when driving at moderate speeds. Seat belts' effectiveness at high speeds is fairly well accepted by the motoring public, the National Safety Council believes.

(Circle No. 52 on Reader Service Card)

HYDRAULIC LIFTS . . . An eight-page brochure (Bulletin No. 441) covering their line of standard, special and automotive hydraulic lifts has just been issued by The Joyce-Cridland Co. In the automotive section, four types of lifts for servicing cars, trucks and buses are covered, including the new two-post "Quick Spot." Tables point out model differences in operation, type of jacking unit, and controls.

(Circle No. 53 on Reader Service Card)

POWER & RACING EQUIPMENT . . . For those interested in power and racing equipment for street to all-out competition, send for Weiand's new Racing Equipment Catalog, which is loaded with accessories for all OHV and flathead engines. Contains manifolds for auto and marine engines, supercharger belt drive kits, adaptors of all kinds, flywheels, linkage, gaskets, etc.

Send 25c to cover handling and mailing, to Weiand Power & Racing Equipment, 2733 San Fernando Rd., Dept. ASD, Los Angeles 65, Calif.

OIL, AIR, FUEL, FILTERS . . . Wix Corp. announces a 116 page catalog of oil, air and fuel filters. Three major sections give: cross reference by filter make and model; replacement specifications by equipment make and model; replacement specifications by equipment manufacturer's part numbers. Contains complete data on cars, trucks, buses, farm and construction equipment, stationary engines, as well as filter equipped foreign cars and trucks.

(Circle No. 54 on Reader Service Card)

You may want this information, and most of it comes to you free. Just circle the key number on the Reader Service Card corresponding to the one that appears with the editorial review. Our Reader Service Department will forward your inquiry to the manufacturer or supplier for attention.

MARINE CONVERSIONS . . . Two publications are available for the dealers and parts jobbers interested in the boating market. The publications offer a way to build larger parts volume through sales of marine conversion kits for automotive engines. The publications, issued by Star Marine Engine Works, include a catalog sheet for their new low-profile Chevrolet V8 conversion kit, and a recently issued bulletin, entitled "What Makes A Marine Conversion." The latter publication covers the various components required to convert an automotive block to marine service and why they are needed, together with information on the degree of economy and performance that can be expected from automotive blocks that have been converted for marine use.

(Circle No. 55 on Reader Service Card)

CHASSIS PARTS FINDER . . . A new, completely revised 12-page manual on chassis parts is announced by McQuay-Norris Mfg. Co. The new book contains photos of chassis parts and applications, together with application charts, and cross-reference part numbers.

(Circle No. 56 on Reader Service Card)

FACTS ABOUT FILTERS . . . is the name of a completely new booklet being offered by Purolator Products, Inc. Although designed to help you sell more oil filters, it highlights the combined effect of selling more oil too. Gives sales arguments to use on customers who want to postpone necessary service . . . easy to read with cartoons emphasizing the many sales and service tips.

(Circle No. 57 on Reader Service Card)

CHASSIS PARTS WALL CHART . . . Aluminum Industries, Inc. is offering a 17"x 22", chassis parts wall chart, spiral-bound and center-punched with a string for hanging. The front cover shows a silhouette of an automobile with the exact location of all chassis parts. Nine additional pages, printed both sides, give detailed information and part numbers by make and model of vehicle, including compacts.

(Circle No. 58 on Reader Service Card)

1961 AUTOMOBILE COLORS . . . An attractive 22"x32" wall chart available from The Arco Co., displays color chips of all colors used on all 1961 automobiles. Grouped by car manufacturer, each color chip is identified by manufacturer's color name and combination number. At a glance the body shop painter or automotive jobber can readily locate any desired color without the necessity of looking at individual color cards or leafing through color books.

(Circle No. 59 on Reader Service Card)

WELDING SCHOOL . . . Latest bulletin (AV-111) outlines the program in arc welding education available at The Lincoln Electric Co. Basic five week course covers fundamentals of manual metallic arc welding; can be expanded to over eleven weeks of training by including such subject matter as pipe welding, hardsurfacing, alloy welding, semi-automatic submerged arc welding, and tungsten inert gas welding.

(Circle No. 60 on Reader Service Card)

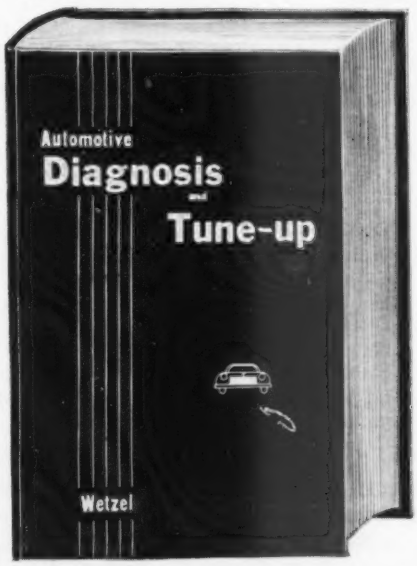
(*Continued on following page*)

A FRIEND INDEED—

THE MASTERFUL SECOND EDITION OF THIS POPULAR BOOK WILL BE TRULY HELPFUL

The new chapters on The Automotive Oscilloscope and Tune-Up Procedure alone are worth the price of the book! It is a "Gold Mine" of information.

MAKE THIS HELPFUL INVESTMENT TODAY!



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- 600 Illustrations
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Why Send RADIATOR Jobs Away?

Many Adding $8,000-$12,000-$15,000 a Year Servicing Radiators!

"Our Inland radiator dept. is taking in an average of $300 a week!"—Douthit-Carroll-San Chez Co., Memphis, Tenn. "Grossed $18,000 the first 9 months."—Harvey C. Jones Co., Reseda, Calif. "Made over $500 my first month."—Roberts Service, Blacksburg, Va. "Taking in $50 a day."—Tillie's Service, Fargo, North Dakota.

Motor Service survey shows radiator repair jobs were up 15.8% last year. Profits from radiator work are sure to steadily become even better due to increasing cooling system pressures.

FREE 48-pg. book, all about Inland equipment, easy-pay plan, free factory training school.

INLAND MFG. COMPANY,
1108 Jackson St., Dept. AD-2, Omaha 2, Nebr.
World's Largest Manufacturer of Radiator Servicing Equipment

WRITE

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Please send new free book, "Blue Print For Profits."

FIRM_____
PLEASE PRINT
ADDRESS_____
CITY_____ ZONE____ STATE_____
BY_____ TITLE_____
If dealer, make of car sold_____
Are you now operating a radiator dept.? ☐ Yes ☐ No

Literature . . . (CONTINUED)

OIL FILTERS . . . A new oil filter catalog now available from the Hastings Manufacturing Co. contains latest oil filter specifications for all popular passenger cars, trucks and tractors, with numerical cross references.
(Circle No. 61 on Reader Service Card)

BONDED SHOE CATALOG. . . The 28-page World Bestos Bonded Brake Shoe Catalog covers drilled brake lining sets and emergency linings as well as bonded sets. Table of FMSI shoe numbers listed according to drum diameters is cross-referenced with the brake shoe diagram section to speed and simplify identification of unlined shoes. Includes diagrams of all FMSI shoe number assignments plus diagrams of shoes in the World Bestos bonded shoe program which have not yet been identified by FMSI.
(Circle No. 62 on Reader Service Card)

LIFTING '61 MODELS . . . A new lifting chart developed by Auto Specialties Mfg. Co. takes the guess-work out of raising the new 1961 models with one-end lifts. Recommended lifting points for all makes and models of U.S. cars are shown on the easy-to-use chart.
(Circle No. 63 on Reader Service Card)

The Word is Out!
IT'S THE SECRET TO BIG PROFITS WITH NO PROBLEMS!
THE Apache
MODEL 310
MOTOR STEAM CLEANER
Designed Exclusively
FOR THE AUTOMOTIVE INDUSTRY
Cleans Engines, Motors and Equipment quickly and efficiently.
The Apache is sold exclusively to automotive jobbers.
Delivers 100 pounds of saturated steam within 90 seconds.
Big 70 gallon capacity.
Fully automatic-push button control.
Completely portable-mounted on E-Z Roll wheels with semi-pneumatic tires.
Equipped with hose, steam gun and hot water rinse attachment.
Guaranteed for life. Over 25,000 units sold and in use.
Sells for only
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Freight paid
Send to Vice President in charge of sales
Apache Motor Steam Cleaner Co., 3330 Ridge Avenue,
P. O. Box 150, Vermillion, South Dakota
Name ..... Title.....
Company ..... Phone.....
Address .....
City ..... State .....
Send me more information and free literature on the complete line of Apache Motor Steam Cleaners.
JOBBERS WANTED
Exclusive territories now available. Mail in coupon or see your manfacturer's representative.
THE BOSS WILL RAVE
AT THE TIME YOU SAVE!

REPLACEMENT FASTENERS . . . The Lamson & Sessions Co. has available a 28-page catalog of automotive replacement fasteners. Popular fasteners are coded to indicate fastest-moving sizes, and a complete selection of fasteners and assortments for car, truck, farm implement and off-the-highway equipment is presented. Additional information on several new items in the bumper bolt, expansion plug and battery hold down lines is provided, along with carriage and machine bolts.
(Circle No. 64 on Reader Service Card)

PISTON RING SPECS . . . The 1961 Hastings piston ring dealer information book, now available for distribution, lists Hastings piston ring specifications for all popular cars, trucks, tractors and small bore engines, with numerical cross reference.
(Circle No. 65 on Reader Service Card)

FILTERS . . . New Lee Filter Corp. catalog contains complete listings of oil, air and fuel filter elements for all domestic and imported passenger cars. Sixty-one different car makes are listed alongside Lee numbers, original-part and manufacturers' numbers. In addition, a separate cross-reference section is included in which oil and air filter numbers are listed for Lee and six other principal filter makers as well as all domestic car manufacturers' original-part numbers.
(Circle No. 66 on Reader Service Card)

FUEL PUMPS . . . A 40-page Ampco Fuel Pump catalog is offered by American Motor Products Co. which covers all model buses, industrial engines, trucks, cars, farm tractors and marine engines. Fully cross-indexed, the catalog provides alphabetized listings of make and model of engine, original and appropriate Ampco part numbers, repair kits, Ampco fuel filter assemblies and elements, and comprehensive interchangeability data.
(Circle No. 67 on Reader Service Card)

RACING CAMS . . . Whether your goal is improved performance, or all-out competition in one of the many divisions of auto racing . . . Howard's has a camshaft to fit your specific individual requirements. 1961 Howard's catalog shows prices and descriptions on the numerous grinds, listed conveniently and according to engine. Catalog also describes the company's other hi-quality speed equipment, such as forged aluminum rods, blower drives, etc.

Send 25c to cover handling and mailing to Howard's Racing Cams, 10122 S. Main St., Dept. ASD, Los Angeles, Calif.

BRUSHING UP ON THOSE

EASY-TO-FORGET THINGS

Refresher course

✓ *Hydrodynamic lubrication*

• BEARINGS, like connecting rod bearings, for example, are subjected to tremendous pressure loads. They encircle the crankpin much like a ring on the finger.

Obviously a film of oil must be established between the two rotating surfaces to reduce friction and wear. As the speed of rotation increases the two bearing surfaces are separated by the development of the oil film. This process is called hydrodynamic lubrication.

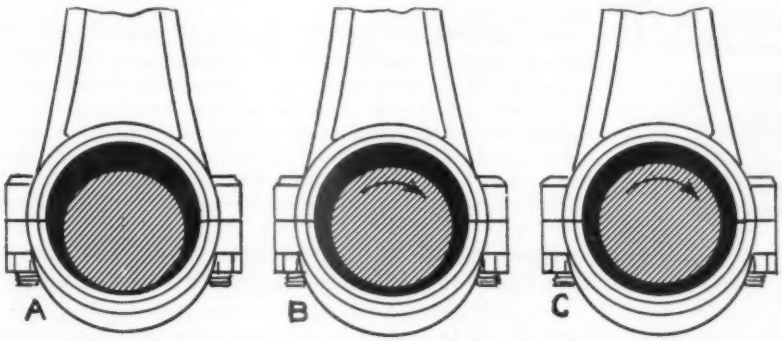


Diagram showing crankpin and bearing at rest (A), in motion (B), and with increase in speed (C). Oil film (solid black) is exaggerated for clarity.

When the engine is not operating, when started or under a heavy load the two surfaces virtually are in contact, sliding against each other with only boundary lubrication, illustrated at (A). As the revolving motion goes on the oil film starts to build up thus separating the rod bearing from the crankpin (B). Then, as the speed of rotation progressively increases the two bearing surfaces are further separated (C).

Lubrication is accomplished by what is commonly referred to as the oil wedge theory. When the shaft begins to rotate, the oil clings to it as a result of adhesion. The lubricant flows up around the top of the shaft and underneath the shaft, the effect produced being much like that of a vane pump. As the shaft picks up speed the oil speed also increases. The oil gradually is wedged underneath and around the shaft because of cohesive action and the shaft is thus gradually moved toward the center of the bearing. As this lifting and centering of the shaft takes place more oil wedges under it, tending to maintain an oil film.

Tool Tips *for the Mechanic*

Removing Dynaflow Oil Seal

Want to save about two hours' work time? Use the SNAP-ON® S-9094A cotter pin tool for pulling the front pump oil seal on all models of Buick Dynaflow transmissions. Tool lets you do the job without removing bell housing. See page 65, Catalog X.

Setting Mercury Caster and Camber

Use the SNAP-ON XL-169 tappet wrench to set caster-camber on 1959-1960 Mercurys that use set screws instead of shims. Works like a charm. It's also handy for loosening gas lines on Chrysler products because the line enters the fuel pump near the radiator and you need plenty of leverage. Page 55, Catalog X.

NEW TOOL

Snap-on S-8366

Caster-Camber Torque Adaptor

This new S-8366 caster-camber torque adaptor does two jobs on 1955-1961 Nashes and Ramblers. It loosens the attaching bolt nut, then turns the bolt and eccentrics to provide caster-camber adjustment.

The 1960 American Motors Manual states that it is impractical to torque the attaching bolt nut due to its hard-to-get-at position. The S-8366 wrench with its 45-degree offset makes the job both practical and easy. Use this adaptor with the SNAP-ON TQ-150 Torqometer. This new tool is not in the catalog. Ask your SNAP-ON man to show it to you.

Removing Chrysler Line Timing Gear Covers

The SNAP-ON S-8173 distributor wrench is just the tool for removing the timing gear cover on all Chrysler line cars. Same tool also saves time removing Chevy fuel pumps. See page 83, Catalog X.

Adjusting Caster-Camber on GM Cars

Use the SNAP-ON WA-303 set for servicing 1957-60 Buicks, Olds, Chevys; 1958-60 Pontiacs; all 1959-60 Chrysler products. Set consists of S-9834 torque adaptor, S-9834-22 and S-9834-23 sockets. Use with TQ-150 TORQOMETER®. Page 76, Catalog X.

SNAP-ON TOOLS CORPORATION

8035-B 28th Avenue • Kenosha, Wisconsin

(Circle No. 131 on Reader Service Card)

LEE LIFETIME

Valve Refacer

- Zero to 90° positive stop — and minus one degree setting
- V-ways with automatic take-up for wear
- Collet Chuck

SUPER FINISH AND EXTREME ACCURACY

MODEL K403C

The only valve refacer that offers all automatic pre-load compensation for wear. No mechanical adjustments necessary, or expensive service or parts replacement. Machines retain original fine accuracy throughout years and years of service.

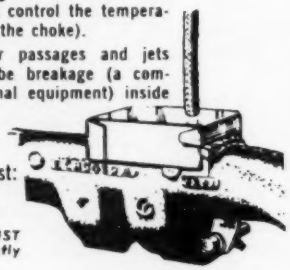
K. O. Lee Company, Aberdeen, S. D.

ONLY THE ORIGINAL, GENUINE

choke-stove

Can Eliminate Carburetor Troubles!

1. By providing the RIGHT AMOUNT of air to the automatic choke.
2. By providing that right amount of air at the RIGHT TEMPERATURE (original heat tube and other choke heaters cannot control the temperature of this air feeding to the choke).
3. By preventing plugged air passages and jets which result from heat tube breakage (a common occurrence with original equipment) inside the exhaust manifold.



Check the BPS "NO" List:

NO DRILLING! NO TAPPING!

NO OBSTRUCTION TO EXHAUST GAS FLOW! (which creates costly back pressures)

NO MANIFOLD SPLITTING! (from expansion and contraction differences of cast iron and steel due to extreme temperature changes)

$3.95 LIST

Engineered to the specific manifold — air-tight fit with the patented BPS asbestos seal — engineered Stoves not drilled bolts or simple heat tubes — mounted outside of manifold (not inside where heat is most intense and breakage chiefly occurs).

Write for complete information

BPS **BETTER PARTS SPECIALTIES**

2601 San Fernando Rd. Los Angeles 65, Calif.

See us at Booth No. 422 I.A.S.I. SHOW

Here's One Reason Why Intake Valves Burn

● USUALLY IT IS the exhaust valves that burn, when valve burning occurs because the exhaust valves handle the very hot gases resulting from combustion in the cylinders. However, there is a certain amount of valve burning on the intakes, and the accompanying picture shows why.

Carbon accumulates around the valve stem on the intake valves under some conditions on some engines. This carbon does no harm until it becomes great enough in amount to strike against the bottom end of the valve stem guide and thus prevent the valve from closing entirely.

If and when this occurs, the burning gases on the power stroke can seep between the valve face and valve seat, which results in actual burning of the metal around the valve face. Naturally this destroys the seal between the valve face and seat, resulting in a leaking valve. When the valve starts to leak the burning progresses quite rapidly until there is such low compression there is no combustion at all in the cylinder, and, of course, no power from that cylinder.

The valve shown on the left is an extreme case of carbon build-up, but illustrates graphically how carbon accumulations on the valve stem can prevent the valve from seating properly. The one on the right has a lot of carbon around the bottom of the valve stem and on the valve head. The accumulation on this valve had not progressed far enough to hold the valve open, but just a little more build-up would have had this result.

Larger Head Bolts and Increased Torque Overcomes Cylinder Head Gasket Leakage

Lincoln-Mercury Division announces that the 1961 Mercury 223 C.I.D. engine incorporates new cylinder blocks with larger cylinder head bolt bosses to accommodate new ½ in. head bolts in lieu of the previously used 7/16 in. head bolts to overcome coolant leaks in cylinder head gaskets. Also being used are new cylinder heads and gaskets, featuring larger cylinder head bolt holes to accommodate the new ½ in. head bolt.

Cylinder head bolt tightening sequence remains the same although the bolts should be torqued to the revised specifications in three steps of 75-85, 85-95 and 95-105 lbs.ft.

Alternator Rotor Shaft Bearings Should Be Replaced, Not Lubricated

The rotor shaft in alternators used on Chrysler products is supported by a ball bearing at the front or pulley end of the shaft and by a needle bearing at the rear or rectifier end. Both of these bearings are lubricated by the manufacturer with a predetermined amount of special lubricant. Usually this lubricant is adequate to protect the bearing for its normal life.

Should you encounter an alternator with a dry needle bearing, *do not attempt to lubricate the bearings,* as an excessive amount of lubricant will contaminate the slip rings and cause premature brush and rotor failures. Al-

ways replace dry needle bearings with a new bearing (MoPar Part No. 2095037) which is prelubricated.

If front bearing replacement is required on either a 1960 or 1961 alternator it is important to use the new bearing (MoPar Part No. 2095653). This new bearing incorporates a shield to prevent the entry of foreign material and is to be installed with the shielded side toward the rotor.

Missing or Wrongly Installed Baffle Reduces Radiator's Cooling Efficiency

The FC-150 "Jeep" truck is equipped with a reverse flow type radiator. The coolant enters the intake tube, flows down one side of the radiator core into the lower tank, then up the other side and out the outlet tube.

To direct the flow of coolant down through the radiator core, a baffle is installed in the upper tank between the inlet and outlet tubes. If this baffle is missing, or improperly installed, some of the coolant will pass from the inlet to the outlet through the upper tank (rather than through the core) reducing the cooling effect of the radiator.

Should a serious case of engine overheating be encountered on a model FC-150, the baffle should be checked. To do this, remove the radiator from the vehicle and stand it on the floor or bench with the inlet and outlet tubes **down.** Attach one radiator hose and pour water into the hose until it rises above the tank. Water will not flow out the other tube if the baffle is correctly installed.

If baffle is missing, or incorrectly installed, replace the radiator—being sure to check the baffle in the replacement radiator **before** installing.

Corvair Using Six Distributor Models

For better starting and acceleration, Corvair has revised initial timing and distributor advance. Six distributors are now in use; identifiable by the color code of their oiler. Some distributors not only have different spark curves, but require different initial settings.

A new timing mark signifying 16° has also been added to the engine housing. Timing now varies from 4° BTDC on early models to 16° BTDC on the high performance engine. Units prior to February 6, 1960, having the early design distributor can be modified to incorporate the revised curve by installation of an Ignition Timer Kit (Part No. 1110252).

Below is complete distributor data and initial timing for all Corvairs:

DISTRIBUTOR ADVANCE SPECS IN ENGINE RPM & CRANKSHAFT DEGS.

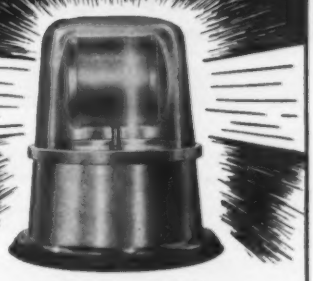
CORVAIR	Oiler Color Identification	Centrifugal Advance (RPM)	Vacuum Advance (Hg.)	Ignition Timing	Degrees Dwell
Early Production (all)	Cadmium	0° at 400 32° at 3600	0° at 6" 23° at 15.2"	33°	4° BTDC
Late Production Synchromesh	Zinc	0° at 400 32° at 3600	0° at 6" 23° at 15.2"	33°	4° BTDC
Intermediate Production RPO-360 Auto. Trans.	Black	0° at 1700 20° at 3600	0° at 7" 23° at 16"	33°	16° BTDC
Late Production RPO-360 Auto. Trans.	Black	0° at 1700 20° at 3600	0° at 7" 23° at 16"	33°	16° BTDC
Early Production RPO-649 High Performance Engine	Copper	0° at 700 6.5° at 1200 24° at 4800	0° at 8" 15° at 15.5"	33°	13° BTDC
Late Production RPO-649 High Performance Engine	Copper	0° at 700 6.5° at 1200 24° at 4800	0° at 6" 23° at 15.2"	33°	13° BTDC

NOTE: If detonation occurs at 16° setting, retard timing 2 to 4°.

Courtesy, Champion Spark Plug Co.

Have you Used Equipment for Sale?
Use our Classified Columns—Page 80

Something NEW in WARNING LIGHTS



AT A PRICE *that will surprise you!*

ROTO-FLASH

360° DOUBLE SEAL BEAM REVOLVING LIGHT

Built by TRIPPE to the very highest standards of quality and performance at a price that can't be equalled!

MAGNA-VAC 360° Revolving LIGHT

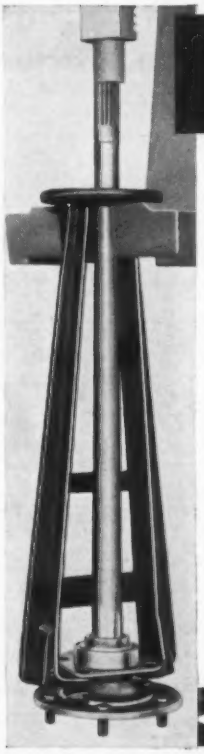
Selling like hot cakes! Unbelievable Price!

MAGNETIC Sticks like Glue!

A sensation for wreckers, service cars, volunteer fire and police. Rugged, noiseless, motor driven—60 powerful flashes a minute. Six magnets hold to any steel surface like grim death. Red, Blue, or Amber dome. Plugs into lighter socket.

Contact Your Jobber . . or send for beautiful catalog & prices

TRIPPE MFG. CO. 133 N. JEFFERSON ST. Dept. ASD, Chicago 6, Illinois.



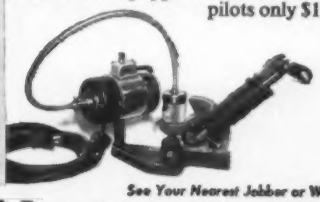
REMOVE BEARINGS FROM FLANGE AXLES *EASILY!*

Remove and replace flange axle bearings quickly and easily. Remove and install Timken bearings without damage. The Wi-To-Co Axle Bearing Fixture lists at only $44.50!

REMOVE AND INSTALL "PRESS FIT" PISTON PINS

When pins become loose just hone old rod and piston to next oversize and press in oversize pin with the Wi-To-Co Pin Fitter. It aligns piston rod, and pin for easy "straight-in" installation. Only $45.38 List Complete.

GRIND VALVES QUICKLY, ACCURATELY—Grind valve seats with the greatest possible accuracy with the Wi-To-Co Feather-Touch Valve Seat Grinder. Equipped with conventional pilots only $193.60 List.



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WINONA TOOL MANUFACTURING CO.

WINONA, MINNESOTA

Manufacturers of the WI-TO-CO IN-THE-BLOK CRANKSHAFT GRINDER

AUTOMOTIVE MARKET PLACE

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CLASSIFIED RATES—50c per word for each insertion. Minimum 20 words. Display ads $30.00 per column inch. Position wanted ads 25c per word. Box number ads $2.00 additional. Payment in advance for all ads. Closing date 10 days in advance of publication date.

Send all orders to: Classified Advertising Manager,
c/o AUTOMOTIVE SERVICE DIGEST, 900 South Wabash Ave., Chicago 5, Illinois

Classified Rate: 50c a Word; Minimum Charge $10.00

AUTOMOTIVE SERVICE DIGEST
900 South Wabash Ave., Chicago 5, Illinois _____ 19____

Please insert the following _____ word Classified advertisements in the_____

issue of AUTOMOTIVE SERVICE DIGEST. Remittance of $_____ is enclosed.

☐ Check here if you want your advertisement to run "T. F." (till forbid). This saves you the bother of ordering your advertisement for each issue and insures your not missing an issue. An invoice will be sent in advance for subsequent insertions as all classified advertising is payable strictly in advance. You can then remit for the next issue; make any changes in copy or cancel your advertisement.

YOUR NAME_____

FIRM NAME_____

STREET ADDRESS_____

CITY, ZONE & STATE_____

Please Note!
Advertisers using an abbreviated firm name or post office box address, must furnish a *complete* firm name street address and the name of owner, president or general manager, for our office records.

Write or Paste Your Best Pulling Advertisement Here

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20—$10.00
21—$10.50	22—$11.00	23—$11.50	24—$12.00
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37—$18.50	38—$19.00	39—$19.50	40—$20.00
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45—$22.50	46—$23.00	47—$23.50	48—$24.00

AGENTS WANTED

FARM EQUIPMENT VALUATION GUIDE sells in volume to Farm Implement Dealers. Big Profits. Write — Farm Guide, NMR, 900 South Wabash, Chicago 5.

Agents Wanted

Automotive Publisher seeks aggressive Agents who now call on Automotive Jobbers.

Easy way to earn extra money.

No subscription selling required.

For further information contact

Automotive Service Digest
Dept. CWT
900 South Wabash Ave.
Chicago 5, Illinois

AUTOMOTIVE BODY TOOLS

NEW AND RESHARPENED Auto Body Files. File resharpening, quick service, quality workmanship, competitive prices. A. O. Barnes Company, Anderson, Indiana.

BUSINESS OPPORTUNITIES

BIG MONEY—Operate own fix-it shop. Service household appliances, motors, mowers, saws, skates, etc. Free book. Christy Trades School, A-190, 3214 W. Lawrence, Chicago 25.

INVENTIONS WANTED

INVENTIONS Wanted for immediate promotion! Patented; unpatented. Outright Cash or Royalties. Free Protection Form; write Casco, Mills Building, Washington 6, D.C.

PARTS FOR SALE

LARGE SUPPLY of New Body Motor Chassis Parts for Kaiser Built Cars. Phelps and Son, 243 Valley Street, Williamsport, Pa.

SALESMEN WANTED

AD BOOK MATCHES
Sell Full or Part Time.

Cash daily commissions bring you tops in steady earnings: Premium Plan for you, customers, lands big orders. Show Glamour Girls, Sensational Tenorama, Hillbillies, Big Holiday Line now ready. All wanted sizes.

FREE Master Outfit tells you where to go, who to see, what to say, for quick sales. Fast Action if you give age, experience.

SUPERIOR MATCH
Dept. BA 1260, 7530 S. Greenwood, Chicago 19

TRADE SCHOOLS

AUTOMOBILE BODY MAINTENANCE TRAINING includes estimating, welding, frame alignment, painting, upholstery, glass replacement. Tuition and fees $75.50 per quarter. Apply Lamar Junior College, Lamar, Colorado.

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Calendar of Automotive Events

1961

Feb. 16-19—1961 International Automotive Service Industries Show, Los Angeles Memorial Sports Arena, Los Angeles, Calif.

Feb. 23-26—Association of Diesel Specialists, Annual Meeting, Granada Hotel & Inn, San Antonio, Texas

May 14-17—Automotive Engine Rebuilders Assn., 39th Annual Convention, Hotel Fontainebleau, Miami Beach, Fla.

June 28-July 1—IGO National Convention, Lowry Hotel, St. Paul, Minn.

July 31-Aug. 2—National Auto Accessories & Parts Exhibit, Las Vegas, Nev.

50 YEARS OF DEPENDABLE SERVICE

Red Book

Official Used Car Valuations

Always have the latest IMPARTIAL, TRUE (Retail, Finance and Wholesale) VALUES of all makes, models. **DOMESTIC** and leading American **IMPORT** cars for past 9 years PLUS Trucks (up to 1½ ton) for past 7 years.

Up-to-the-minute, revised-for-your-area, bound editions sent you eight times a year.

YOUR REGIONAL EDITION.....$9.00

RED BOOK's see-at-a-glance TRUE VALUES for YOUR AREA IS WHY MORE BANKS, INSURANCE AND FINANCE COMPANIES DEPEND ON RED BOOK.

NATIONAL MARKET REPORTS, Inc.

900 South Wabash Avenue
Chicago 5, Illinois

HE WHO LAUGHS, COME WHAT MAY,

WILL LIVE TO LAUGH ANOTHER DAY

Short circuit smiles

Two men were commenting on a friend's bad luck at the horse race.

"Funny," said one, "how lucky Joe is at cards but how unlucky at the track."

"Nothing funny about it," his friend answered. "They don't let him shuffle the horses."

★ ★ ★

Joan—"I simply can't stand my husband. He has such a nasty disposition he's made me so jittery that I'm losing weight."

Aunt—"Why don't you leave him and go back to mother?"

Joan—"Oh, I will. I'm just waiting 'til he gets me down to 120 pounds."

★ ★ ★

A woman was leading her young daughter across the street in the middle of the block, during rush-hour traffic. Suddenly the loud-speaker of a police safety car blared:

"Little girl, will you please show your mother how to cross a street?"

★ ★ ★

A liquor store we know has been sending these cards to clients and prospects: "Since you can't refrain from drinking, start a saloon in your own home. Be the only customer and you won't have to buy a license. Give your wife $55 to buy a case of whiskey. There are 240 drinks in a case. Buy your drinks from your wife at 60 cents each and in twelve days you will have $89 and the $55 to buy another case. If you live ten years, continuing to buy whiskey from your wife, and die in your boots, your widow will have $27,085.47 in the bank—enough to bring up the children, pay off the mortgage, marry a decent man and forget she ever knew a bum like you."

Times have changed. Today a man pays a half a dollar to park his car so he won't be fined two dollars while spending a dime for a nickel cup of coffee.

★ ★ ★

Coming home much earlier than usual, Pat was surprised to find his wife with masculine company. But being a woman, she was not at a loss for words:

"You, Pat, are always able to tell a good story about why you are out so late. Now tell a good story about why you're home so early!"

★ ★ ★

"Mama, can I go in swimming?"

"No, dear, the water's dangerous here."

"But Daddy's swimming."

"Yes, dear, but Daddy's insured."

"My husband has an awful temper. Could you put this on the bill as an oil-change job?"

A woman divorced her husband and obtained custody of their 12-year-old son. Then she remarried and her ex-husband was somewhat concerned about the boy. "How do you get along with your stepfather?" he asked the lad.

"Fine," said the youngster. "He takes me swimming every day. We go out to the middle and then I swim back."

"Isn't that a long swim for a boy of your age?" asked the father.

"Not too bad. Really, the only tough part is getting out of the bag."

★ ★ ★

Father: "Son, I know a man who doesn't smoke, drink or chase women and he just celebrated his 100th birthday."

Son: "How?"

★ ★ ★

The warden of one of the more advanced prisons began to feel sorry for one of the prisoners—a friendly enough fellow except on visitors' day. Then, while most of the prisoners received kinfolk and such, this fellow stayed alone in his cell.

One visiting day, the warden called him into the office. "Ben," he said kindly. "I notice you never have any callers. Don't you have any friends—or family?"

"Oh, sure," replied Ben happily, "but they're all in here."

★ ★ ★

"What is the secret of your success?"

"A strong will."

"A strong will, you say?"

"Yep—a strong will that left me two hundred and fifty thousand dollars!"

★ ★ ★

One of Harry Hershfield's favorite stories is about two burly assassins waiting in ambush for a royal personage. They had hidden themselves behind a bush on the path of the palace grounds which His Majesty passed every day, precisely at noon. Well, noon came and went, another hour went by and another, but the intended victim didn't appear. The killers grew impatient.

"I can't understand why he doesn't come," muttered one.

"Neither can I," whispered the other. "I hope nothing's *happened* to him!" ....

★ ★ ★

A man rushed into a drugstore and asked the druggist how to stop the hiccups. The answer was a slap in the face. Amazed and angry, the man demanded the reason for such behavior.

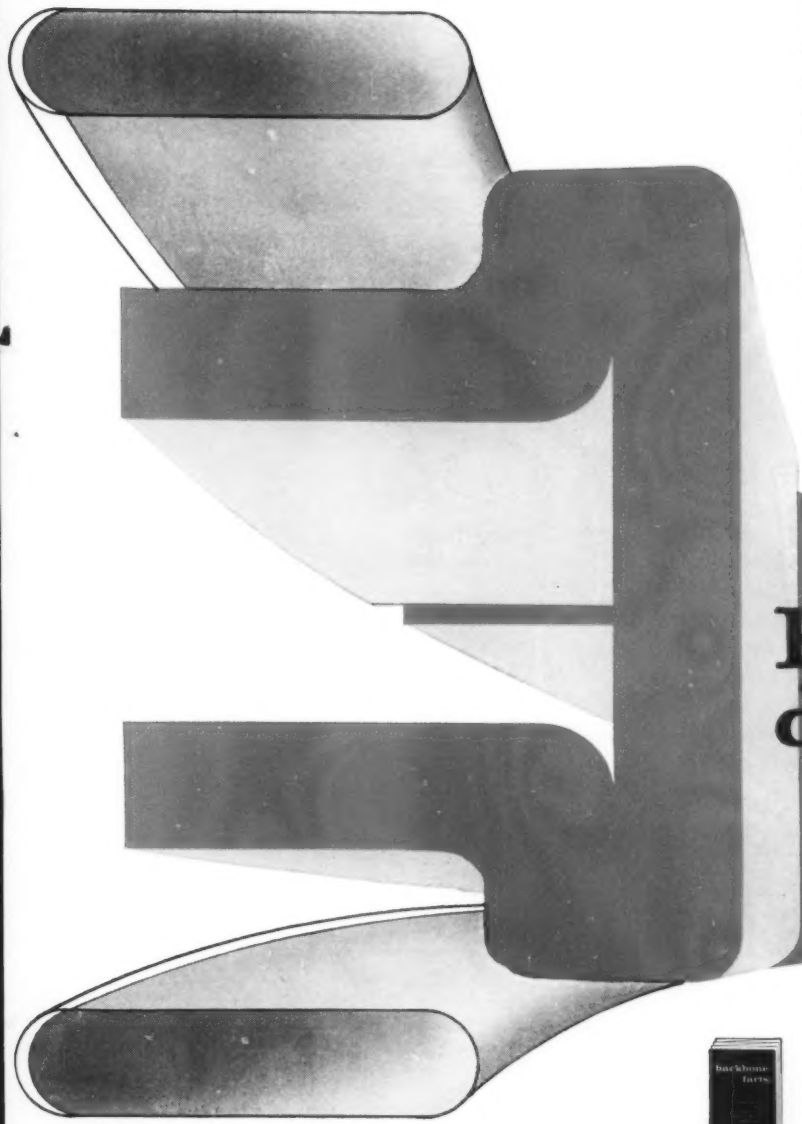
"Well," the druggist said, "you don't have the hiccups now, do you?"

"No," shouted the customer, "but my wife out in the car still has."

★ ★ ★

The merchant mailed a bill for an overdue payment to a customer. To it he attached a note that read, "This bill is one year old." By return mail the merchant had his bill back. To it was attached another note: "Happy Birthday."

how the shoulders of the RAMCO BACKBONE seal rails against the groove— to stop high vacuum oil pumping



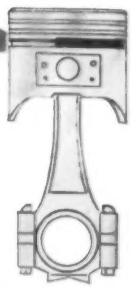
There is a difference in modern, self-expanding oil rings—especially the Ramco C-9.

The difference we show here is the backbone construction of the C-9—and how its activating shoulders give your rings side of groove sealing.

You've seen how it works. The C-9 won't let oil get from behind the ring because the shoulders are slightly angled. This angle—precisely engineered—gently presses the rail against the side of the groove, both top and bottom—and won't let oil pass. This adds to the ring's effectiveness in stopping oil pumping.

Next time you install a Ramco C-9, look for this difference. Feel the shoulders, note the strength. And after you've installed it, note the effectiveness. It works.

the backbone *makes the* difference



Side of groove sealing is only one of the many differences the Ramco backbone brings you. They are all described in our folder: "BACKBONE FACTS." See your Ramco Jobber, or write for your free copy:
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The secret of the extra resilient, longer lasting performance of new FEL-CoPRENE is the exclusive rubber formula developed by FEL-PRO in conjunction with leading car factories. This special composition rubber maintains its shape and sealing ability at higher pressures and temperatures better than conventional types. Its extra resiliency compensates for expansion—gives better conformability for all surfaces. New FEL-CoPRENE saves on installation time, too. It goes on faster because it fits right every time. FEL-CoPRENE is only available for a limited number of models right now, but you'll be able to get FEL-CoPRENE for most popular late models in the near future. Ask your FEL-PRO Jobber for the facts or write for samples and literature to: Felt Products Mfg. Co., Skokie, Ill. Since 1918.

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